UNITED STATES OF AMERICA:
WAR DEPARTMENT.

MONTHLY WEATHER REVIEW.

(GENERAL WEATHER SERVICE OF THE UNITED STATES.)

DECEMBER, 1887.

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WASHINGTON CITY:
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1888.

List of merchant marine steam and sailing vessels from which International Simultaneous Meteorological reports were received at the Office of the Chief Signal Officer, U. S. Army, Washington, D. C., in time to be used in the preparation of the Weather Review for the month of December, 1887.

Name of vessel.		Captain.
Allan Line.		
Br. s. s. Manitoban		Capt. Wm. Dunlap.
Scandinavian		John Park.
Siberian		R. P. Moore.
American Line.		
Br. s. s. British King		John Kelly.
British Prince		S. Nowell.
British Princess		E. H. Freeth.
Am. Indiana		W. J. Bogge.
Lord Clive		F. Urquhart.
Br. Lord Gough		E. M. Hughes.
Anchor Line.		
Br. s. s. Alsatia		J. Brown.
Devonia		W. G. Crockhart.
Ethiopia		John Wilson.
Furnessia		J. Hedderwick.
India		John Jameson.
Tyrian		A. Haig.
Atlas Line.		
Br. s. s. Ailsa		J. W. Sanson.
Alvena		F. McKay.
Alvo		D. Williams.
Athos		H. Low.
Atlas		J. W. Tobin.
Claribel		J. Evans.
Bordeaux Steam Navigation Co.		
Fr. s. s. Chateau Leoville		M. Le Chapelain.
Bristol-City Line.		
Br. s. s. Llandaff City		T. H. Gore.
Cromwell Line.		
Am. s. s. Hudson		H. R. Freeman.
Louisiana		E. V. Gager.
New Orleans		T. P. C. Halsey.
Clyde Line.		
Am. s. s. Yemassee		1st Off. J. C. Norton.
Cunard Line.		
Br. s. s. Aurania		Capt. W. H. P. Hains.
Cephalonia		Henry Walker.
Etruria		T. Cook.
Gallia		M. Murphy.
Pavonia		A. McKay.
Samaria		J. B. Watt.
Servia		H. McKay.
Umbria		W. McMickan.
Earn Line.		
Br. s. s. Earnmoor		R. Grey.
Furness Line.		
Br. s. s. British Queen		R. Wills.
Stockholm City		W. Thompson.
Gottenburg City		James Harrison.
General Trans-Atlantic Steamship Co.		
Fr. s. s. La Bourgogne		E. Franguel.
La Bretagne		M. de'Jousselin.
La Champagne		E. Traub
La Normandie		G. de Kersabiec.
Great Western S. S. Line.		
Br. s. s. Warwick		L. Morice.
Guion Line.		
Br. s. s. Arizona		S. Brooks.
Nevada		J. Douglas.
Wisconsin		E. Bentley.
Hamburg-American Line.		
Ger. s. s. Gothia		H. Bauer.
Moravia		O. Pezoldt.
Rhaetia		H. Vogelgesang.
Rugia		A. Albers.
Inman Line.		
Br. s. s. City of Chester		A. Lewis.
City of Chicago		Fred Watkins.
City of Richmond		A. Redford.
Ohio		R. W. Sargent.
Pennsylvania		A. B. Thomas.
Johnston Line.		
Br. s. s. Baltimore		J. Trenery.
Leyland Line.		
Br. s. s. Bavarian		Robt. Leask.
Bulgarian		E. Parry.
Virginian		M. Fitt.
Mallory Line.		
Am. s. s. Alamo		Samuel Risk.
Colorado		J. Daniel.
Lampasas		M. B. Crowell.
Rio Grande		Jas. F. Lewis.
State of Texas		Gilbert Williams.

Name of vessel.		Captain.
Mississippi & Dominion Steamship Co.		
Br. s. s. Vancouver		Capt. C. J. Lindall.
Morgan Line.		
Am. s. s. Eureka		R. B. Quick.
New York		Geo W. Mason.
National Line.		
Br. s. s. Canada		J. Robinson.
Denmark		R. S. Rigby.
Egypt		J. Sumner.
England		A. F. Hesley.
Erin		Thos. Foot.
France		A. D. Hadley.
Greece		A. J. Jeffrey.
Holland		Wm Tyson.
Italy		Wm. Pearce.
Spain		W. A. Griffiths.
N. Y., Havana & Mexican Mail S.S. Co.		
Am. s. s. City of Washington		W. M. Rittig.
North German Lloyd Steamship Co.		
Ger. s. s. Aller		H. Christoffers.
Elder		H. Baur.
Ems		Th. Jungst.
Fulda		R. Ringk.
Hermann		A. Kohlman.
Rhein		W. Topser
Saale		H. Richter.
Trave		P. Berdrow.
Werra		R. Bussius.
Weser		H. Bruns.
Occidental and Oriental S. S. Co.		
Br. s. s. Oceanic		John Metcalf.
Ocean Steamship Company.		
Am. s. s. City of Augusta		J. W. Catherine.
Old Dominion Steamship Company.		
Am. s. s. Breakwater		J. E. Dale.
Manhattan		Frank Stevens.
Pacific Mail Steamship Company.		
Am. s. s. City of Para		L. Dexter.
Colon		F. Henderson.
Newport		W. G. Shackford.
Red "D" Line.		
Am. s. s. Philadelphia		Sam. Hess.
Red Star Line.		
Belg. s. s. Belgenland		W. A. Beynon.
Nederland		A. J. Griffin.
Noordland		H. E. Nickels.
Pennland		Rud Weyer.
Switzerland		J. Ueberweg.
Vaderland		C. H. Grant.
Waesland		H. Buschmann.
Westernland		Com. W. G. Randle.
Rotterdam Line.		
Dtch. s. s. P. Caland		Capt. F. H. Bonjer.
Zaandam		W. Ponsen.
Leerdam		G. Stenger.
Schiedam		A. Potjer.
Rotterdam		G. J. Vis.
Royal Mail Steamship Co.		
Am. s. s. City of Dallas		C. W. Read.
State Line.		
Br. s. s. State of Georgia		G. Moodie.
State of Indiana		A. Ritchie.
State of Nebraska		A. G. Braes.
State of Pennsylvania		A. J. A. Mann.
Thingvalla Line.		
Dan. s. s. Geiser		C. W. Möller.
Island		W. Skjodt.
Twin Screw Line.		
Br. s. s. Richmond Hill		A. Hyde.
Union Line.		
Ger. s. s. Amalfi		Julius Bahr.
Australia		G. Franck.
California		O. Winkler.
Polaria		Johannes Schade.
Polynesia		A. Kuhn.
Warren Line.		
Iowa		E. W. Owens.
Kansas		W. Gleig.
Norseman		D. Morris.
Palestine		Whiteway.
Roman		E. Maddox.

Name of vessel.		Captain.
White Cross Line.		
Belg. s. s. DeRuyter		Capt. J. J. Brarens.
Pieter de Coninck		E. Smit.
White Star Line.		
Br. s. s. Adriatic		I. G. Cameron.
Arabic		Geo. Burton
Britannic		H. Parsell.
Celtic		P. J. Irving.
Republic		H. Davidson.
Wilson Line.		
Br. s. s. Bassano		W. Rea.
Buffalo		J. H. Malet.
Egyptain Monarch		John Harrison
Marengo		T. M. Irwin.
Martello		Wm. Abbott.
Persian Monarch		Bristow.
Santiago		R. Potter.
Miscellaneous.		
Br. s. s. Australia		A. M. McRitcher.
Am. Albatross, U. S. F. C.		Z. S. Tamur.
Br. Ambrose		Edward Besson.
Barrowmore		John Inch.
Bohemia		R. Karlowa.
Span. Carolina		Alex. Ugalde.
Br. Cyprus		E. Guild.
Duke of Buckingham		T. C. Burnside.
Ethelbald		C. Smith
El Callao		Joseph Schlotz.
Span. Elcano		Hipizug.
Br. Gwendoline		Robert Milburn.
Ger. India		M. Hulsen.
Br. Kings Cross		G. J. Mills.
Lake Nepigon		P. D. Murray.
Ger bk. Leocadia		John Stohff.
Am. Light-ship No. 37		Andrew Jackson.
Lorenzo D. Baker		W. F. Wiley.
Br. Neuces		Jas. Bolger.
Napier		J. W. W. Hender-
Oranmore		B. Jones. [son.
Pomona		J. Legoe.
Roxbury Castle		A. Turpin.
Taormina		G. W. Koch.
Span. Serra		F. de Luzarags.
Br. Strathleven		C. W. Pearson.
Surrey		R. Griffiths.
Tower Hill		F. Archer.
H. S. M. S. Trejs		
Br. Wentmore		C. W. Simpson.
New York Herald Weather Service.		
Br. s s. Advance		J. Lord.
Alaska		Geo. S. Murray.
Am. Algiers		J. B. Percy.
Br. Barracouta		Robert Hubbard.
Caracas		N. M. Hopkins.
Am. El Monte		J. W. Hawthorn.
El Paso		H. S. Quick.
Knickerbocker		F. Kemble.
Br. Landaff City		T. H. Gore.
Nova Scotian		R. H. Hughes.
Orinoco		J. S. Garvin.
Am. Portia		Henry Dawson.
Br. Samana		W. Taylor.
Sailing vessels.		
Am. bg. Abbie Clifford		D. W. Storer.
Br. bk. Achsah		Alfred M. Shaw.
Am. bk. Alice		W. G. Kair.
Ger. bk. Atlanta		A. Witte.
Ger. sp. Fidelio		T. H. Schutte.
Am. bgt. Bonny Doon		Chas. Burgess.
Dtch. bk. Helena		T. T. Verbeet.
Am. bk. Henry Warner		Paine.
schr. John J. Hanson		L. J. Stevens.
sp. Independence		S. Pavet.
bk. Jacquinne		J. Gardner.
bg. Jane Adeline		G. W. Cates.
Swed. bk. Qvos		G. Olsen.
Br. sp. Sapphire		G. W. Murray.
Am. bg. Manson		J. V. M. Kowen.
bk. Sarah Doe		B. S. Merryman.
Br. sp. Winnifred		R. MacDonald.

UNITED STATES SIGNAL SERVICE

MONTHLY WEATHER REVIEW.

VOL. XV. WASHINGTON CITY, DECEMBER, 1887. No. 12.

INTRODUCTION.

This REVIEW treats generally the meteorological conditions of the United States and Canada for December, 1887, and is based upon the reports of regular and voluntary observers of both countries. Descriptions of the storms that occurred over the north Atlantic Ocean are also given, and their paths shown on chart i, on which also appear the distribution of icebergs and the limits of fog-belts west of the fortieth meridian.

A noteworthy feature of this month was the severe weather which prevailed over the West India Islands during the first decade, attending the passage of three cyclones, most unusual occurrences for December, two of which moved northwest to the vicinity of Bermuda, and thence recurved northeastward, and one advanced westward over the Caribbean Sea.

The mean temperatures were below the normal in all parts of the country, except on the north Pacific coast, in Florida, and from the upper lakes eastward to the New England and middle Atlantic coasts, in which districts the month was slightly warmer than the average. The deficiencies in the monthly mean temperatures were greatest over the region from the Rio Grande Valley northwestward to Arizona and Utah, where they ranged from 4° to 8°.

The rainfall was deficient over an area extending from eastern Tennessee and western North Carolina northward to the lower lakes, and also in California and portions of the Rocky Mountain region; it was above the average on the Atlantic and Gulf coasts, in the Missouri, Mississippi, and lower Ohio valleys, the excess being most marked in the Gulf states and Rio Grande Valley.

Under "Notes and extracts" will be found a table showing means of a series of hourly barometric observations at Washington City for a period of eight months—May to December, 1887, with a brief discussion of same.

Chart iii for this month shows the normal and current temperature curves for three stations in addition to those given in November chart.

In the preparation of this REVIEW the following data, received up to January 20, 1888, have been used, viz., the regular tri-daily weather-charts, containing data of simultaneous observations taken at 133 Signal Service stations and 23 Canadian stations, as telegraphed to this office, 173 monthly journals and 171 monthly means from the former and 23 monthly means from the latter; 260 monthly registers from voluntary observers; 52 monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports through the co-operation of the Hydrographic Office, United States Navy, and the "New York Herald Weather Service;" monthly weather reports from the local weather services of Alabama, Illinois, Indiana, Louisiana, Michigan, Mississippi, Missouri, Nebraska, New England, New Jersey, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, and Tennessee, and the Central Pacific Railway Company; trustworthy newspaper extracts, and special reports.

ATMOSPHERIC PRESSURE (expressed in inches and hundredths).

The distribution of mean pressure for December, 1887, determined from the tri-daily telegraphic observations of the Signal Service, is shown by isobarometric lines on chart ii.

The area of maximum mean pressure for December, 1887, embraces the middle plateau, and is indicated by the isobar of 30.20 which incloses portions of Oregon, Idaho, Utah, and Nevada; areas of minimum pressure occupy the north Pacific coast and the Gulf of Saint Lawrence, where the mean falls to 29.95 and slightly below. The stations reporting the extreme monthly means are: Port Angeles, Wash., 29.93, and Winnemucca, Nev., 30.26. Over the greater part of the country east of the Rocky Mountains the range of mean pressure is between 30.0 and 30.1.

As compared with November an increase in the monthly means is shown in the central and southern Rocky Mountain regions and thence westward to the Pacific coast; an increase also occurs in the upper Missouri valley, and from the lower lakes and Ohio Valley eastward to the Atlantic. While the excess is generally less than .05 it amounts to .10 on the middle Pacific coast and from .05 to .09 in the New England and middle Atlantic states. In other districts than those above-named the mean pressure for December is below that for November, but the deficiency nowhere exceeds .04, except on the west Gulf coast, where it amounts to .05.

The departures from the normal pressure at the various Signal Service stations are given in the table of miscellaneous meteorological data. The mean pressure for December, 1887, is above the normal, as follows: in the middle and southern Rocky Mountain districts and thence westward to the Pacific coast, in the states on the Atlantic from the Carolinas northward, in the upper Ohio valley, along the northern border from Montana eastward, and in southern Florida. In all other districts the mean pressure is below the normal. The most marked excess, .10, occurs on the central Pacific coast, and the greatest deficiency, .05, on the west Gulf coast.

BAROMETRIC RANGES.

The monthly barometric ranges at the various Signal Service stations are also given in the table of miscellaneous meteorological data. The ranges, as usual, conform to the general rule, that is, they increase with the latitude and decrease slightly, though somewhat irregularly, with increasing longitude. In all of the northern districts the barometer ranges of December, 1887, are decidedly greater than the normal for the month, the difference amounting to .20 on the north Pacific coast, to .30 in the lower Missouri and upper Mississippi valleys, and from .50 to .60 in New England. In the states bordering on the Atlantic the extreme ranges are: .47 at Key West,

Fla., and 2.01 at Block Island, R. I.; between the eighty-fifth and one hundredth meridians, .91 at New Orleans, La., and 1.55 at La Crosse, Wis.; on the Pacific coast, .36 at San Diego, Cal., and 1.50 at Port Angeles, Wash.

AREAS OF HIGH PRESSURE.

Eight areas of high pressure were traced over the United States and adjoining territories during the month of December. They were generally first observed in the northwest portion of the continent and, with one exception, to the north of the fortieth parallel. Six approached the stations from the region north of Montana, and two were first observed on the Pacific coast, where, after extending over the plateau regions, they disappeared by a decrease of pressure while within the limits of observation. A secondary area of high pressure formed to the east of one of these high areas and afterwards passed over the central valleys, while the principal area moved northwest from the central plateau region to the north Pacific coast. Five of these areas of high pressure passed eastward to the Atlantic, the direction of their movement being first to south of east, and as they approached the coast the direction changed to east or north of east, this change being most marked in the high areas moving over the lower latitudes. The high areas observed were slightly more to the north than those usually observed during December.

The following are detailed descriptions of the more important weather changes attending each area of high pressure:

I.—This area of high pressure appeared to the north of the Lake region before the close of the preceding month, and was referred to in the November REVIEW. At 7 a. m. of December 1st it extended over the Saint Lawrence Valley, the central area of high pressure being inclosed by an isobar of 31.10. It passed southeast over New England and the Maritime Provinces and extended southward along the Atlantic coast, causing strong northeast winds, which were followed by fogs and light local showers on the 2d and 3d. The maximum pressure occurred before the centre reached the coast line, but the barometer continued to rise during the 1st from New England southward to Florida. The temperature fell below zero in northern New England, and to freezing in the Gulf and south Atlantic states during the passage of this area.

II.—The 3 p. m. report of the 3d indicated the approach of this area from the region north of Montana, the pressure having increased at stations in the northern and central plateau regions during the preceding eight hours, while an extended depression covered the eastern slope of the Rocky Mountains. The winds were northerly at Rocky Mountain stations, and by 7 a. m. of the 4th a secondary area of high pressure had formed, central over Colorado, the barometer, however, remaining high in the region where this area was first observed. From the succeeding reports of the 5th, 6th, and 7th this secondary area has been traced to the Atlantic coast, attended by fair weather, causing no marked change in temperature.

III.—This area appeared off the California coast on the afternoon of the 5th, and although no marked weather changes occurred in its passage over California into the central plateau region it is noteworthy as having approached the stations from the Pacific and as having disappeared within the limits of the stations by a gradual decrease in pressure. It extended over southern California and thence eastward over Arizona and Utah during the 6th, 7th, and 8th, after which it moved northwestward, but its centre could not be definitely located.

IV.—This high area appeared north of Dakota on the 5th, and moved slowly eastward north of Minnesota and Lake Superior; it was not central within the limits of the United States until it reached northern New England on the morning of the 9th. The pressure increased during its easterly movement, and reached the maximum, 30.60, while passing over the Saint Lawrence Valley. After passing the coast line it apparently moved more directly to the east and disappeared rapidly in advance of a depression moving northeastward from the Ohio Valley.

V.—On the morning of the 9th this area of high pressure was observed north of Montana. It first moved slowly eastward during the following twenty-four hours and was central north of Manitoba on the morning of the 10th. The temperature fell decidedly in the Missouri Valley during the 10th, and snows were reported generally throughout the Northwest, attended by fresh to brisk northerly winds. During the 11th this area of high pressure was transferred to the southern Rocky Mountain slope, the pressure having diminished from 30.60 to 30.30. After reaching Indian Territory and Arkansas on the 12th, it passed eastward over Tennessee and Virginia during the 12th and 13th, attended by fair weather. After reaching the Atlantic coast it apparently moved northeastward to Nova Scotia, where it disappeared on the 15th.

VI.—This high area was central off the Oregon coast on the 12th. It moved slowly eastward over the northern plateau region, and after the centre had reached the eastern portion of Idaho a secondary depression formed in the Missouri Valley while the principal area of high pressure moved slowly northeastward to the north Pacific coast, where it disappeared as a separate depression, but probably formed a part of the succeeding high area which was passing eastward over British Columbia on the 19th.

VII.—This area of high pressure was attended by a cold wave which extended southward to the Gulf coast. The barometer reached a maximum of 31.00 at stations north of Montana at midnight of the 19th, where the temperature ranged from 20° to 30° below zero. The cold wave extended southward to northern Texas by the morning of the 20th. A severe "norther," with killing frost, was reported from southern Texas during the night of the 20th and morning of the 21st. The cold wave attending this high area extended over the central valleys during the 21st, but the area of high pressure did not pass to the east of the Mississippi Valley. The pressure remained high over the plateau region until the 24th.

VIII.—This area of high pressure was observed north of the upper Missouri valley on the morning of the 26th, with well-defined areas of low pressure to the east, south, and west. The depression that was central over Colorado was apparently forced southeastward to northern Texas, after which it moved rapidly northeastward to the Lake region, attended by heavy snows, and followed by decidedly colder weather in the central valleys and Lake region. The temperature fell during the morning of the 29th to —40° in northern Minnesota and below zero as far south as central Missouri and Kansas. Killing frosts were reported from New Orleans and freezing weather throughout the Gulf states and northern Florida on the same date. The centre of this area of high pressure remained north of Minnesota until midnight of the 29th, after which it moved southeastward over the upper lake region and the upper Ohio valley, the pressure decreasing from 31.00 inches to 30.50. After reaching the upper Ohio valley the direction of movement changed to the northeast, and at the close of the month it was central in northern New England, the pressure at the centre remaining near 30.50.

AREAS OF LOW PRESSURE.

Eleven well-defined areas of low pressure have been traced over the territory occupied by the stations of observation during the month of December. Of these, three apparently originated in the Gulf of Mexico and passed northeastward, following the coast line from Florida to Nova Scotia; two were first observed to the west of the north Pacific coast and disappeared to the north of the Lake region; and the remainder apparently originated in the Rocky Mountain regions. All low areas observed to the west of the one hundredth meridian moved first in a direction south of east, and, with two exceptions, all low areas east of the one hundredth meridian moved to the north of east, the change of direction generally occurring near that meridian. The average rate of movement of these depressions was twenty-nine miles per hour, and generally the velocity of each depression differed but slightly from the average.

The following table shows the latitude and longitude in which each area was first and last observed, and the average hourly velocity in miles per hour:

Number of area.	First observed.		Last observed.		Average hourly velocity.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
	° ′	° ′	° ′	° ′	*Miles.*
I	37 00	108 00	48 00	85 00	35.0
II	41 00	127 00	50 00	85 00	26.0
III	30 00	101 00	47 00	59 00	20.0
IV	25 00	95 00	46 00	62 00	25.0
V	52 00	114 00	48 00	83 00	26.0
VI	28 00	89 00	48 00	92 00	27.0
VII	51 00	109 00	43 00	89 00	27.0
VIIa	35 00	100 00	41 00	71 00	30.0
VIII	50 00	100 00	43 00	84 00	27.0
IX	26 00	88 00	38 00	71 00	39.0
X	41 00	108 00	50 00	66 00	35.0
XI	44 00	124 00	45 00	90 00	30.0

Average rate of progress, 29.0 miles per hour.

The following are detailed descriptions of the weather conditions attending the more important areas of low pressure:

I and II.—At the close of the preceding month an area of low pressure was central in the Rocky Mountain region over Colorado, a second depression covering the north Pacific coast, attended by southerly winds and rains as far south as southern California. During the 1st day of the month this depression extended northeastward to the upper lake region, and a barometric trough extended from Lake Superior southwestward to Texas, the low area previously noted as central on the north Pacific coast advancing eastward over the northern plateau region. During the 2d the area traced as number i disappeared to the north of the Lake region while number ii moved eastward, and by the morning of the 3d the centre had reached its most southerly latitude in western Kansas. The 3 p. m. report of the 3d showed that the direction of movement of low area number ii had changed to the northeast, and that it was then central in western Iowa, attended by general rains from the Gulf to the Lake region and by snow from the upper lake region westward to the Rocky Mountains. The barometric pressure at the centre remained about constant, near 29.50, during the movement of this depression from the Pacific coast to the Missouri Valley. The pressure decreased rapidly and the disturbance became more contracted as it approached Lake Superior, where it attained its maximum energy on the morning of the 4th, the disturbance being well-defined, circular in form, and the lowest isobar bounding the centre being 29.4. When the depression disappeared to the northeast of Lake Superior it was followed by severe westerly gales and a decided fall in temperature in the Northwest and Lake region.

III.—This area of low pressure developed in the southern Rocky Mountain region to the southeast of a high area which advanced from the Pacific over California, Nevada, and Utah, the barometer being high at the same time to the north of Minnesota and on the Atlantic coast. It moved slowly eastward over the west Gulf states, Mississippi, and Alabama during the succeeding forty-eight hours, attended by heavy rains, but with low wind velocities, the barometric gradient remaining very slight, the lowest isobar bounding the centre being 29.9. This easterly movement continued until the 9th, when the direction changed directly to the north, causing the disturbance to pass over the Ohio Valley to the lower lake region. During the passage of this area over the eastern portion of the United States general rains occurred in the Southern and Eastern States and snows in the upper lake region and Northwest, which were quickly followed by clearing weather. After the disturbance reached the upper Saint Lawrence valley a secondary disturbance developed on the middle Atlantic coast and moved rapidly northeastward to Nova Scotia, causing the primary area to disappear. The barometer fell slowly at the centre of this disturbance as it advanced northeastward, and when last observed over the Maritime Provinces the barometer had fallen to 29.42 at Bird Rocks, Gulf of Saint Lawrence. Westerly gales, however, continued at these stations until the 14th.

IV.—This low area was first observed in the west Gulf, southeast of Brownsville, Tex., on the night of the 12th. Vessel reports indicate that a severe storm occurred to the southeast of this location on the 10th and 11th. This disturbance developed but slight energy while moving eastward along the west Gulf coast and south Atlantic states during the 13th and 14th. After reaching the south Atlantic coast on the morning of the 15th it moved rapidly northeast and reached the southeastern New England coast as a severe storm by midnight of the 15th. The barometer fell at the centre .90 in twenty-four hours during its passage from Hatteras, N. C., to Yarmouth, N. S. Gales were unusually severe on the New England coast during the 16th, and the disturbance probably reached its maximum energy when the centre was between Yarmouth and Halifax, N. S., the barometer falling to 28.9 at 3 p. m. on the 16th. The pressure rose slowly at the centre of this depression as it passed northeastward from Halifax, and the reports indicate that it became more extended and lost energy as it moved to the northeast.

V.—This disturbance passed north of the stations of observation from the Rocky Mountains to Lake Superior from the 14th to 17th, without causing any marked change in the weather conditions within the United States.

VI.—This area developed in the Gulf of Mexico, where it was first observed on the morning of the 16th. The barometer at the centre when passing over the Gulf coast was below 29.8, and the pressure decreased rapidly as the disturbance approached Cape Hatteras, where the barometer was 29.28 on the afternoon of the 17th. Dangerous winds occurred in Florida and along the south Atlantic coast during the passage of this depression over those regions, and the intensity of the storm continued to increase until the centre reached the New England coast. On the morning of the 18th the pressure had fallen to 28.88 at southeast New England stations, and the direction of the wind indicated that the centre of disturbance passed near Cape Cod. The storm apparently moved in a more northerly direction after the centre reached Cape Hatteras than its previous course indicated, until it reached the coast of Maine, where the direction changed to the northeast. The barometer continued low at the centre, but it rose slowly after the disturbance left the New England coast.

VII.—When the storm described as number vi was central on the North Carolina coast on the afternoon of the 17th, this disturbance appeared in the Rocky Mountain region north of Montana, while an area of high pressure covered the central plateau region. It moved southeastward to the upper Mississippi valley, where it was central on the morning of the 19th, the barometer being low over the entire eastern slope of the Rocky Mountains, and an area of unusually high pressure was advancing over the northern Rocky Mountain stations. The advance of this area of high pressure over the upper Mississippi valley caused this disturbance to disappear, and a secondary depression formed in the west Gulf states during the 19th. This secondary depression developed great energy, and moved northeastward over the central Mississippi valley during the 20th, followed by a decided cold wave which extended over the Southern States, attended by freezing weather and killing frosts. After the centre of this disturbance reached northern Indiana a secondary disturbance developed on the middle Atlantic coast, and moved northeastward to southern New England, causing severe gales during the night of the 21st. As this disturbance disappeared to the eastward the barometer remained low in the Lake region, with general snows, delaying the advance of the cold wave over the northern stations. Westerly gales continued on the New England coast on the 22d, after this disturbance had moved eastward.

VIII.—This depression approached the stations from north of Manitoba, where it was central at 10 p. m. of the 22d. It moved southeastward with considerable energy until it reached eastern Michigan, causing general snows throughout the Lake

region and Northwest, but the disturbance disappeared by an increase of pressure while central within the Lake region, and when the depression traced as number ix was moving northeastward over the east Gulf. It should also be noted that the depression traced as number v disappeared in almost the same location near Lake Huron, while similar conditions existed in the south Atlantic states.

IX.—This depression was first observed as central in the east Gulf, near Mobile, Ala., at midnight of the 23d. It moved along the south Atlantic coast during the 24th, causing heavy rains and brisk to high winds. It was central near Wilmington, N. C., at 10 p. m. of the 24th, after which it passed northeastward from Hatteras, the direction and force of winds reported from southern New England stations indicating that the centre of disturbance passed to the southeast of, and near, those stations.

X.—This area of low pressure developed in the Rocky Mountain region during the 26th, it having been preceded by a depression on the north Pacific coast, from which it appears to have developed as a secondary disturbance. It moved southeastward to northern Texas during the succeeding twenty-four hours, where it changed direction to the northeast, moving over the central valleys as a trough-shaped depression extending from Lake Michigan to the west Gulf states. It was followed on the 27th and 28th by the most severe cold wave of the month, the temperature changes in the Missouri, Mississippi, and Ohio valleys being rapid, and, in many cases, ranged from 40° to 50° in twenty-four hours. After reaching the Lake region the disturbance became more contracted and the winds increased in force after shifting to westerly throughout the Lake region and on the Atlantic coast, and velocities ranging from fifty to fifty-five miles per hour were reported on the New England coast on the 28th, when this storm was central in northern Maine. The gales continued on the 29th in the Lake region, and from Hatteras, N. C., northward to New England. This storm apparently moved northward from New England, and its centre was last located north of Anticosti on the afternoon of the 29th; after which it probably moved northeastward.

XI.—This area of low pressure appeared on the north Pacific coast on the 28th and moved southeastward with a uniform velocity of about thirty miles per hour, crossing the central Rocky Mountain region on the 30th, and its course changing to northeasterly near the one hundredth meridian. It passed to the upper Mississippi valley, where it was central at the close of the month, attended by general snows throughout the Northern States, and rains from the Ohio Valley southward to the Gulf states. When this disturbance was observed on the north Pacific coast the barometer near the centre was 29.32; while passing the central Rocky Mountain region it fell to 29.20 at Denver and Las Animas, Colo., and at 10 p. m. of the 31st the central area was inclosed by an isobar of 29.3, almost circular in form, extending over central Wisconsin, while areas of high pressure covered the lower Saint Lawrence valley and the region north of the Missouri Valley, the difference of baromter readings between the areas of high and low pressure exceeding one inch, thus causing a decided barometric gradient in both the east and west quadrants of this disturbance.

NORTH ATLANTIC STORMS FOR DECEMBER, 1887.

[*Pressure in inches and millimetres; wind-force by Beaufort scale.*]

The paths of the depressions that appeared over the north Atlantic Ocean during December, 1887, have been determined from international simultaneous observations by captains of ocean steamships and sailing vessels, received through the cooperation of the the Hydrographic Office, Navy Department, and the "New York Herald Weather Service."

Thirteen depressions are traced, of which seven advanced eastward from Newfoundland or the Grand Banks; one occupied the ocean between the British Isles and Iceland during the 1st and 2d; two originated to the westward of the Azores; two moved northwest from the region east of the Windward Islands, and one is given an approximate westward track over the Caribbean Sea. With the exception of numbers 1, 9, and 11 the depressions pursued normal paths.

In December, 1886, ten depressions were traced, of which five passed eastward from Newfoundland; four developed over the ocean south of Nova Scotia; one first appeared over mid-ocean in about N. 55°, and one moved eastward in the vicinity of the Azores. The severest weather of the month attended the passage of a depression from south of Nova Scotia to the British Isles from the 2d to the 8th, inclusive. During the 7th and 8th storms of almost unprecedented violence raged over Great Britain, and the fall in the barometer was reported as having been unparalleled. At Orme's Head a minimum of 27.45 (697.2) was observed, while at Liverpool the barometer fell to 27.48 (698.0). During the second and third decades of the month the weather was seasonable.

In December, 1887, the depressions traced north of the fortieth parallel corresponded closely in number with the December average, and the disturbances which attended their passage were of normal intensity. In the vicinity of the West India Islands, and over the ocean south and southeast of Bermuda, there was an unusual prevalence of cyclonic disturbances during the early part of the month, occasioning loss of life and great damage to property, more particularly at the Island of Hayti. During the first decade of the month stormy weather prevailed over the entire ocean east of the seventieth meridian, and the barometric fluctuations were frequent and marked. During the second decade severe gales continued along the trans-Atlantic tracks, and off the middle Atlantic and New England coasts. During the third decade the region of greatest storm frequency extended from the American coast north of the thirty-fifth parallel to the twentieth meridian. Compared with the corresponding month of previous years, December, 1887, did not present abnormal meteorological features over the Atlantic in the middle and northern latitudes, while over the southern part of the ocean the severe storms of the first decade constituted a noteworthy departure from the usual winter weather in that region.

In the following descriptions of the depressions traced, positions are given in degrees latitude and longitude, except in cases where twenty-five to thirty-five minutes are cited, when they are shown in degrees and half degrees:

1.—This storm was a continuation of depression number 13 traced for November, 1887, and was central December 1st about seven degrees south-southeast from Bermuda, with heavy gales over the West India Islands and northward to Nova Scotia. By the 2d the storm-centre had moved slowly northwest, and at 12 noon, Greenwich time, was located about five degrees south of Bermuda. During this date hard north to northeast gales continued west of the sixty-fifth meridian. By the 3d the depression had slowly recurved north and northeast, and during the succeding twenty-four hours advanced east-northeast to about N. 33°, W. 56°. The chart of the 5th shows that, subsequent to 12 noon, Greenwich time, of the 4th, the centre of depression recurved to the northwest, which fact is attributed to the presence on those dates of an area of high barometer over the ocean to the east and northeast of its position, whereby it was deflected from a normal northeasterly course. During the following four days the depression pursued a somewhat rapid normal course to the British Isles and disappeared over the North Sea after the 10th, accompanied throughout by gales attaining hurricane force. The following reports relative to this storm have been rendered: Bermuda, a heavy ne. to n. gale prevailed during the 2d and 3d. Captain Mollieu, of the s. s. "Marsielle," reports: "3d, in N. 29°,

W. 56°, at noon; 2 a. m. wind s.; later strong ssw. gale, heavy cross sea; 4th, in N. 29°, W. 59°, at noon; ssw. gale increasing."

2.—This storm was a continuation of depression number 14 traced for November, 1887, and on December 1st was central in about N. 33°, W. 46°, whence it moved north of east to about N. 34°, W. 39° by the 2d, after which it disappeared. The depression was accompanied by fresh to strong gales, and barometric pressure about 29.50 (749.3) was shown on the 1st.

3.—This depression apparently originated on the 1st off the northeast edge of the Banks of Newfoundland, whence it advanced to the northwest of the British Isles by the 6th, during which and the following date the storm-centre apparently moved southeast over the North Sea. The storm possessed moderate energy until the 5th and 6th, when pressure below 29.00 (736.6) and strong to whole gales were reported. Capt. A. J. A. Mann, of the s. s. "State of Pennsylvania," encountered a strong sw. to nw. gale on the 5th and 6th, during which the barometer fell to 29.00 (736.6) at 8 p. m. of the 5th, in N. 55°, W. 13°.

4.—This depression advanced south of east from the sixtieth parallel, in about W. 20°, to the north of Scotland by the 3d, after which it disappeared beyond the region of observation, attended on the 3d by severe gales on the northern coasts of Great Britain.

5.—This depression was central on the 4th to the eastward of the Windward Islands, whence it moved northwest to about N. 25°, W. 63° by the 5th. Recurving north and northeast the storm is traced to N. 44°, W. 32° by the 10th, after which it passed northward and united with depression number 7. This storm, in connection with depression number 1, which it closely followed, was attended by a heavy "norther" over the West Indies during the first four days of the month, during which many vessels were wrecked. On the 4th, during a violent gale, an immense wave struck the beach at Baracoa, Cuba, broke and flowed inland, destroying nearly three hundred huts and houses without, however, an attendant loss of life. On the 6th and 7th the bark "Leocadia" encountered a whole gale, veering from se. to nw.; lowest barometer at 9 p. m. of the 6th, in N. 31°, W. 56°. Captain Young, of the s. s. "Kate Fawcett," reports a gale, attaining hurricane force on the 7th; position at noon, N. 36°, W. 51° 30′. The s. s. "Orsino," on the 8th, in N. 35° 30′, W. 46°, had an increasing ssw. gale, which veered to wnw. The s. s. "Westergate," on the 9th, had a terrific gale, with squalls and tremendous cross seas; wind veered from s. to nw.; position at noon, N. 38°, W. 37° 30′.

6.—This depression is given a probable westerly track over the Carribbean Sea from the 7th to the 12th, inclusive, after which it apparently passed over Central America into the Pacific Ocean. During the 7th and 8th a heavy "norther," evidently occasioned by this depression, swept over the West Indies, causing much damage to shipping.

7.—This depression passed eastward over Newfoundland, and on the morning of the 7th was central off Saint John's. By the 8th the storm-centre had moved northeast beyond the region of observation.

8.—This depression first appeared over the southern edge of the Banks of Newfoundland on the 9th, with central pressure about 29.80 (756.9), from which position it advanced to the north of Ireland by the 14th, and subsequently disappeared beyond the eastern limits of reports. As shown by the following reports, the depression augmented energy during its eastward progress: Captain Archer, of the s. s. "Tower Hill," reports a whole gale on the 11th and 12th; wind changed from se. to ne., and backed to nw.; lowest barometer, 29.38 (746.2), on the 11th, in N. 49°, W. 47° 30′. Capt. Morice, of the s. s. "Warwick," reports a gale from the 11th to the 13th; wind veered from ese. to nnw.; lowest barometer, 29.34 (745.2), at 4 a. m. of the 12th, in N. 51°, W. 30°. The s. s. "Montauk," had a whole westerly gale on the 13th and 14th; lowest barometer, 29.01 (736.8), at noon of the 14th; in N. 56°, W. 28°. The s. s. "Island" had a strong gale on the 13th and 14th; wind veered from se. to w., and backed to ene.; lowest barometer, 28.62 (726.9), at 4 a. m. of the 14th, in N. 58° 30′, W. 13°.

9.—This depression passed eastward over Newfoundland, and at noon, Greenwich time, of the 14th was central in N. 53°, W. 40°. By the 16th the centre of depression had advanced over the British Isles, its course being attended by disturbances of marked violence.

10.—This depression was a continuation of a storm which moved from the Gulf of Mexico northeastward along the coast to Newfoundland from the 14th to the 17th. By the 18th the storm-centre had advanced over Newfoundland to N. 50°, W. 50°, from which position it passed eastward and disappeared after the 19th. The depression developed great energy after the 15th, and was attended by severe storms in the vicinity of Nova Scotia and Newfoundland during the 16th and 17th.

11.—This depression pursued a track similar to, and closely followed, number 10, its progress subsequent to the morning of the 17th being marked by storms of exceptional severity off the middle Atlantic, New England, and Canadian coasts. By the 20th the storm-centre had passed to the northeast of Newfoundland, and during the next three days it moved slowly eastward and disappeared over mid-ocean after the 23d. The following reports indicate the character of the disturbances which accompanied the depression: A heavy gale prevailed along the New England coast during the night of the 17th. Captain Pearson, of the s. s. "Strathleven," reports a whole gale on the 17th and 18th; wind veered from e. by s. to sw.; lowest barometer at 4 a. m. of the 18th, in N. 40°, W. 70°.

12.—This depression moved northeastward along the coast, and on the morning of the 24th was central about three degrees east of Saint John's, N. F., whence it passed slowly north of east and disappeared over mid-ocean after the 27th. The depression was attended by strong to whole gales throughout, with barometric minima ranging to 29.00 (736.6) after the 27th.

13.—This depression appeared on the 28th southeast of the Banks of Newfoundland, and while it may have been a continuation of an area of low pressure which moved northeast off the middle Atlantic coast during the 24th and 25th, data at hand will not admit of accurately determining this point. During the 28th, 29th, and 30th the depression advanced north of east to the northward of the Azores, and on the 31st was apparently central over the ocean between the Azores and the Spanish Peninsula.

OCEAN ICE.

On chart i the positions of two icebergs reported during the month are shown by ruled shading. On the 26th the s. s. "Mentmore" passed a small berg in N. 46° 10′, W. 47° 28′, and on the 28th the s. s. "Austrian" passed a small berg in N. 48° 20′, W. 48° 40′. For December, 1886, no icebergs were reported. In December, 1885, several bergs were observed off the Newfoundland coast and over the Banks during the latter part of the month. For December of the three preceding years no icebergs were reported.

FOG.

The limits of fog-belts to the westward of the fortieth meridian are shown on chart i by dotted shading.

As compared with the chart for the preceding month, November, 1887, the eastern and southern limits of the Newfoundland fog-belt have contracted about one degree, although in each of these months isolated fog-areas were reported off the southeast edge of the Banks. To the southward of Nova Scotia there has been a decrease in the number of fog-areas, while along the coast of the United States fog was reported about two degrees farther south than in November.

On the fifteen dates for which fog was reported near Newfoundland the meteorological conditions were as follows: On the 1st a low barometer area moved east-northeast from the Banks, the passage of its centre being preceded by southerly winds and fog. From the 2d to the 4th, inclusive, the barometer continued high in that region, and no fog was reported. During the 5th, 6th, and 7th the approach and passage of two

areas of low pressure, one from the southwest and the other from the west, were attended by fog. During the 9th a low barometer area passed eastward off the southern edge of the Banks, but no fog reports have been received for that date. During the 10th, 11th, and 12th the barometer was high and no fog appeared. On the 13th an area of low pressure passed eastward from the Gulf of Saint Lawrence, and dense fog prevailed over the Banks. From the 15th to the 22d, inclusive, fog prevailed, attending the approach of depressions which advanced northeastward along the coast and passed over Newfoundland. From the 23d to the 28th, inclusive, north to west winds prevailed over the Banks, and no fog was reported. During the 29th and 30th an area of low pressure, central over the Gulf of Saint Lawrence, occasioned south to east winds and fog over the Banks. On the 31st a shift of wind to west and northwest caused a disappearance of fog.

Fog was reported off the south coast of Nova Scotia during the 13th and 14th, with west to northwest winds and rising barometer, following the passage of an area of low pressure eastward over the Gulf of Saint Lawrence and Newfoundland on the 13th.

During the 11th and 12th a fog of unusual density extended along the coast from Cape Henlopen to Boston. During this period an area of low pressure moved northeastward along the coast from Hatteras and united off the New England coast with a low barometer area which had advanced eastward from south of Lake Erie. This fog is reported as having caused a complete suspension of navigation along the middle Atlantic coast, and on the rivers from one to two degrees inland; and its great density over so extended an area may be attributed to the abnormally large inflow into the region it covered of warm vapor-laden air from the ocean, and colder, dry air from the continent, attending the cyclonic circulation of winds around the low barometer areas referred to.

The following are the limits of fog-areas on the north Atlantic Ocean during December, 1887, as reported by shipmasters:

Date.	Vessel.	Entered.			Cleared.		
		Lat. N.	Lon. W.	Time.	Lat. N.	Lon. W.	Time.
		° ′	° ′		° ′	° ′	
1	S. S. La Bretagne	47 40	45 30	1 a. m.	47 25	46 30	3 a. m.
5-6	S. S. Rugia	46 50	43 18		44 32	51 00	
6	S. S. Erin	45 58	46 00		45 48	46 40	
6	Fog at Saint John's, N. F.						
6-7	Sp. Minnesota	46 31	46 43	Noon	45 16	52 04	11 a. m.
7	S. S. Erin	44 54	51 00		44 50	51 20	
7	Fog at Saint John's, N. F.						
11-12	S. S. Caracas	40 15	73 50		Sandy Hook.		
11-12	S. S. Haytien Republic	40 53	69 25	6 a. m.	Boston		8 a. m.
11-12	S. S. British King	38 48	73 55		Cape Henlopen		
13	S. S. City of Richmond	44 13	56 42	9.40 a. m.	44 28	55 46	9.40 p. m.
13-14	S. S. Cynthia	44 05	60 02	8 a. m.	Halifax		
15	S. S. Peruvian	*		4 a. m.	St. John's, N. F.		Midnight.
16	Fog at Saint John's, N. F.						
17	do						
17	S. S. Bohemia	45 10	49 50		45 08	50 07	
		44 49	51 54		44 42	52 20	
18	S. S. Jan Breydel	47 00	48 20	8 a. m.	45 30	54 00	8 p. m.
18	S. S. Belgenland	46 29	43 59	8 a. m.	45 16	48 05	Midnight.
18	Fog at Saint John's, N. F.						
19	do						
19	S. S. Belgenland	44 41	51 31	Noon	44 27	52 33	4 p. m.
20	Fog at Saint John's, N. F.						
20-21	S. S. Marengo	47 22	45 34		45 52	49 38	
20-21	S. S. Buffalo	46 40	44 12		45 03	50 23	
20-21	S. S. Island	47 16	46 55		45 30	48 40	
21	Fog at Saint John's, N. F.						
22	S. S. British Prince	47 32	44 54		46 53	47 05	
29	Fog at Saint John's N. F.						
29-30	S. S. Nova Scotian	†		8 a. m.	45 55	55 42	Noon.
30	S. S. India	42 00	50 00		42 00	51 00	
30	Fog at Saint John's, N. F.						

*One hundred and fifty miles east of Saint John's, N. F.
†Saint John's, N. F.

TEMPERATURE OF THE AIR (expressed in degrees, Fahrenheit).

The distribution of mean temperature over the United States and Canada for December, 1887, is exhibited on chart ii by dotted isothermal lines. In the table of miscellaneous data are given the monthly mean temperatures, with the departures from the normal, for the various stations of the Signal Service. The figures opposite the names of the geographical districts in the columns for mean temperature, precipitation, and departures from the normal, show respectively the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the departure is below the normal, and subtracting when above.

In the Lake region, Ohio Valley, southern New England, the middle Atlantic states, southern Florida, and on the Pacific coast north of the fortieth parallel, the month was slightly warmer than the average, but in all other districts it was colder. The deficiencies in the monthly mean temperatures exceed 2° over the greater part of the territory to the west of the Mississippi River, and over an extended area reaching from the mouth of the Rio Grande River northwestward to Arizona and Nevada the mean temperatures range from 4° to 8° below the normal. The excess of temperature was greatest in the upper lake region, where it amounted to from 2° to 4°.

The following are some of the most marked departures from normal temperatures at Signal Service stations:

Above normal.	°	Below normal.	°
Alpena, Mich	4.1	Prescott, Ariz	8.3
Escanaba, Mich	3.8	Winnemucca, Nev	7.0
Mackinaw City, Mich	3.6	Fort Grant, Ariz	6.6
Port Huron, Mich	2.7	Corpus Christi, Tex	6.4
Pittsburg, Pa	2.3	Fort Davis, Tex	6.0
Washington City	2.2	Rio Grande City, Tex	5.8
New York City	2.1	Abilene, Tex	5.7
Key West, Fla	2.0	Santa Fé, N. Mex	5.2

RANGES OF TEMPERATURE.

The monthly and the greatest and least daily ranges of temperature at Signal Service stations are given in the table of miscellaneous meteorological data. As usual the ranges were greatest over the region between the Mississippi and the Rocky Mountains, where they generally vary from 60° to 80°; the least monthly ranges occur on the Pacific coast, and are 30° or below at most stations.

The following are some of the extremes:

Greatest.	°	Least.	°
Saint Vincent, Minn	87.2	Tatoosh Island, Wash	16.6
Fort Assinaboine, Mont	81.8	Key West, Fla	17.8
Denver, Colo	80.2	Fort Canby, Wash	18.3
Fort Custer, Mont	77.9	Port Angeles, Wash	22.6
Fort Totten, Dak	76.2	Olympia, Wash	25.5
Fort Stanton, N. Mex	75.3	Portland, Oregon	28.3
Willcox, Ariz	75.3	San Francisco, Cal	28.9
North Platte, Nebr	74.2	Linkville, Oregon	34.2

The greatest daily ranges of temperature amounted to, or exceeded, 53° at Yankton, Dak., on the 23d, Willcox, Ariz., 9th, and Fort Supply, Ind. T., 17th. The lowest daily ranges were 2°, or below, at Green Bay, Wis., on the 9th, Linkville, Oregon, 8th, and Astoria, Oregon, 22d.

FROST.

In all districts except the Southern States frosts were of daily occurrence. In the east Gulf states they were reported on the 6th, 11th, 13th, 18th, 19th, 21st, 22d, 24th to 26th, and 28th to 30th; in the west Gulf states, 5th, 6th, 9th, 12th to 14th, 16th to 31st; Florida, 19th, 29th, 30th; lower Rio Grande valley, 18th, 21st to 25th; northern California, 3d, 7th, 10th, 11th, and from 13th to 31st; southern California, 2d, 5th, 8th to 10th, 12th, 15th, 17th to 20th, 22d to 26th, 28th, 31st.

DEVIATIONS FROM NORMAL TEMPERATURES.

The following table shows for certain stations, as reported by voluntary observers, (1) the normal temperatures for a series of years; (2) the length of record during which the observations have been taken, and from which the normal has

been computed; (3) the mean temperature for December, 1887; (4) the departures of the current month from the normal; (5) and the extreme monthly means for December during the period of observations and the year of occurrence:

State and Station.	County.	(1) Normal for the month of Dec.	(2) Length of record.	(3) Mean for December, 1887.	(4) Departure from normal.	(5) Extreme monthly mean temperature for December.			
						Highest.		Lowest.	
						Am't.	Year.	Am't.	Year.
		°	Years	°	°	°		°	
Arkansas.									
Lead Hill	Boone	38.0	6	35.0	−3.0	44.2	1881	29.1	1884
California.									
Fall Brook	San Diego	52.3	11	49.8	−2.5	55.0	1883	49.8	1887
Sacramento	Sacramento	46.1	22	42.6	−3.5	50.9	1880	39.5	1874
Connecticut.									
Middletown	Middlesex	28.3	29	30.0	+1.7	.....	.....	.....	.....
New Haven	New Haven	30.7	101	32.6	+1.9	.....	.....	.....	.....
Thompson	Windham	27.7	30	28.3	+0.6	.....	.....	.....	.....
Waterbury	New Haven	29.2	12	29.0	−0.2	.....	.....	.....	.....
Illinois.									
Aurora	Kane	24.6	8	24.6	0.0	.....	.....	.....	.....
Collinsville	Madison	31.8	8	29.8	−2.0	.....	.....	.....	.....
Golconda	Pope	34.0	9	35.7	+1.7	.....	.....	.....	.....
Greenville	Bond	30.2	19	29.6	−0.6	.....	.....	.....	.....
Mattoon	Coles	29.7	7	30.0	+0.3	.....	.....	.....	.....
Peoria	Peoria	28.6	32	29.9	+1.3	.....	.....	.....	.....
Rockford	Winnebago	23.9	15	23.6	−0.3	.....	.....	.....	.....
Riley	McHenry	21.6	26	22.2	+0.6	.....	.....	.....	.....
Indiana.									
Logansport	Cass	29.0	33	31.0	+2.0	45.0	1877	14.0	1872
Spiceland	Henry	29.2	34	30.4	+1.2	.....	.....	.....	.....
Vevay	Switzerland	34.6	21	35.5	+0.9	.....	.....	.....	.....
Iowa.									
Cresco	Howard	16.2	15	18.0	−1.8	.....	.....	.....	.....
Kansas.									
Independence	Montgomery	33.5	16	30.3	−3.2	47.2	1887	25.4	1884
Lawrence	Douglas	29.3	20	28.1	−1.2	44.4	1877	19.8	1872
Wellington	Sunman	30.8	9	31.8	+1.0	38.6	1881	25.6	1880
Yates Centre	Woodson	28.7	8	28.2	−0.5	37.2	1881	22.8	1884
Maine.									
Belfast	Waldo	23.4	28	25.4	+2.0	.....	.....	.....	.....
Cornish	York	22.5	30	24.3	+1.8	27.5	1877	14.2	1857
Gardiner	Kennebec	23.0	51	25.5	+2.5	.....	.....	.....	.....
Orono	Penobscot	20.9	19	23.7	+2.8	.....	.....	.....	.....
Maryland.									
Cumberland	Alleghany	33.3	16	32.9	−0.4	38.5	1881	26.0	1880
Fallston	Harford	33.0	17	33.4	+0.4	40.2	1877	23.6	1876
McDonogh	Baltimore	33.0	10	33.9	+0.9	39.7	1881	26.0	1880
Massachusetts.									
Amherst	Hampshire	26.7	50	29.7	+3.0	.....	.....	.....	.....
Cambridge	Middlesex	29.1	65	31.0	+1.9	.....	.....	.....	.....
Fitchburg	Worcester	25.8	31	27.2	+1.4	.....	.....	.....	.....
New Bedford	Bristol	31.9	76	32.2	+0.3	.....	.....	.....	.....
Springfield	Hampden	27.7	21	29.6	+1.9	.....	.....	.....	.....
Taunton	Bristol	30.5	16	31.9	+1.4	.....	.....	.....	.....
Nevada.									
Carson City	Ormsby	35.8	8	31.2	−4.6	.....	.....	.....	.....
New Brunswick.									
Saint Johns	Saint Johns	22.6	27	23.1	+0.5	.....	.....	.....	.....
New Hampshire.									
Concord	Merrimac	26.0	20	29.5	+3.5	.....	.....	.....	.....
Hanover	Grafton	20.8	26	22.4	+1.6	.....	.....	.....	.....
New Jersey.									
Dover	Morris	29.8	5	30.4	+0.6	.....	.....	.....	.....
New York.									
Factoryville	Tioga	27.6	6	29.6	+2.0	29.6	1887	22.3	1886
Humphrey	Cattaraugus	24.1	4	27.6	+3.5	27.6	1887	20.1	1886
North Volney	Oswego	25.6	20	27.2	+1.6	33.7	1881	18.0	1876
Palermo	Oswego	24.6	34	25.4	+0.8	31.9	1857	17.6	1872
Ohio.									
Wauseon	Fulton	26.3	17	26.9	+0.6	38.8	1877	17.1	1872
Yellow Springs	Greene	30.1	3	30.9	+0.8	33.3	1885	26.1	1886
Pennsylvania.									
Corry	Erie	26.5	8	27.9	+1.4	35.2	1881	20.2	1886
Dyberry	Wayne	25.0	23	26.1	+1.1	.....	.....	.....	.....
Rhode Island.									
Providence	Providence	30.0	56	32.5	+2.5	.....	.....	.....	.....
South Carolina.									
Stateburg	Sumter	46.9	7	45.3	−1.6	51.3	1883	43.6	1882
Tennessee.									
Milan	Gibson	38.0	5	38.4	+0.4	.....	.....	.....	.....
Texas.									
New Ulm	Austin	53.6	13	48.8	−4.8	60.9	1875	46.1	1876
Vermont.									
Lunenburg	Essex	19.4	38	22.1	+2.7	.....	.....	.....	.....
Strafford	Orange	21.3	13	22.2	+0.9	29.5	1881	13.5	1876
Virginia.									
Bird's Nest	Northampt'n	41.6	19	41.2	−0.4	.....	.....	.....	.....
Dale Enterprise	Rockingham	38.6	7	36.2	−2.4	51.4	1880	28.4	1882
Variety Mills	Nelson	36.4	11	34.9	−1.5	43.3	1879	30.6	1876, '86
Wytheville	Wythe	34.8	23	35.3	+0.5	42.0	1879	26.0	1876
West Virginia.									
Helvetia	Randolph	33.2	11	35.1	+1.9	42.5	1879	24.6	1880

TEMPERATURE OF WATER.

The following table shows the maximum, minimum, and mean water temperature, for December, 1887, as observed at the harbors of the several stations; the monthly range of water temperature; the average depth at which the observations were made, and the mean temperature of the air:

Station.	Temperature at bottom.				Mean temperature of air at the station.	Average depth of water in feet and tenths.
	Max.	Min.	Range.	Monthly mean.		
	°	°	°	°	°	
Canby, Fort, Wash	47.9	40.6	7.3	44.6	43.6	17.9
Cedar Keys, Fla	67.3	50.2	17.1	59.5	57.5	7.4
Charleston, S. C	54.9	48.2	6.7	52.3	51.1	36.9
Eastport, Me	45.0	39.0	6.0	42.4	25.5	16.3
Galveston, Tex	64.7	40.3	24.4	53.7	15.2	53.3
Key West, Fla	75.8	70.8	5.0	73.5	19.7	72.0
New London, Conn †	46.5	40.5	6.0	43.3	35.0	12.2
New York City	43.2	35.1	8.1	40.2	30.1	14.7
Pensacola, Fla *	59.7	46.7	13.0	*52.3	53.5	17.9
Portland, Me	40.9	36.4	4.5	39.6	27.9	16.4
Portland, Oregon	46.0	39.0	7.0	41.8	42.6	54.2

† 26 days. * 15 days.

Table of comparative maximum and minimum temperatures for December.

State or Territory.	Stations.	For 1887.		Since establishment of station.				Length of record.
		Max.	Min.	Max.	Year.	Min.	Year.	
		°	°	°		°		Y'rs.
Alabama	Mobile	69.3	25.4	78.8	1884	14.0	1880	17
Do	Montgomery	67.8	22.0	77.1	1884	8.0	1880	16
Arizona	Prescott	57.0	7.5	70.0	1881	−18.0	1879	12
Do	Fort Apache	57.2	1.1	70.0	1882	− 8.0	1884	10
Arkansas	Fort Smith	71.5	8.0	78.1	1883	7.7	1886	6
Do	Little Rock	65.0	13.5	74.0	1880, 1884	6.0	1880	9
California	San Francisco	69.3	40.4	68.0	1878	34.0	1879	17
Do	San Deigo	74.5	35.5	82.0	1874	32.0	1879	17
Colorado	Denver	66.5	−13.0	74.1	1885	− 2.5	1876	17
Do	Montrose	47.6	−16.2	55.5	1885	−10.1	1885	3
Connecticut	New Haven	55.5	7.5	62.0	1875	− 9.5	1884	10
Do	New London	57.3	8.8	60.5	1879	− 7.5	1883	16
Dakota	Fort Buford	44.8	−25.0	59.3	1885	−47.0	1879	8
Do	Yankton	45.2	−16.4	62.0	1875	−35.0	1879	15
Dis. of Columbia	WashingtonCity	59.0	14.2	73.0	1873	−11.5	1880	18
Florida	Jacksonville	70.3	31.0	81.0	1875	19.0	1880	17
Do	Key West	80.5	62.7	88.0	1876	44.0	1876	18
Georgia	Atlanta	64.9	15.3	71.0	1879	1.0	1880	10
Do	Savannah	70.6	28.0	80.0	1875	16.0	1880	17
Idaho	Boisé City	53.1	10.2	60.5	1885	− 7.3	1884	10
Illinois	Cairo	58.2	5.0	72.0	1875	− 7.0	1872	16
Do	Chicago	53.4	− 4.8	68.0	1875	−23.0	1872	16
Indiana	Indianapolis	57.0	− 3.0	68.0	1875	−10.0	1876	15
Indian Ter	Fort Sill	68.0	7.6	77.0	1880	2.0	1880, 1884	11
Iowa	Dubuque	49.6	−15.5	64.0	1878	−23.5	1886	15
Do	Des Moines	50.4	−12.6	57.0	1883	−19.5	1886	10
Kansas	Dodge City	60.3	− 9.0	73.0	1875	−13.5	1876	14
Do	Leavenworth	62.2	− 9.8	72.0	1875	−14.0	1880	17
Kentucky	Louisville	60.2	4.0	74.0	1875	− 4.0	1880	16
Louisiana	New Orleans	77.0	29.4	78.0	1875, 1879	20.0	1870, 1880	18
Do	Shreveport	74.0	20.0	79.0	1875	10.0	1880	15
Maine	Eastport	49.6	−10.0	54.0	1877	−21.0	1884	15
Do	Portland	54.8	− 1.8	59.0	1884	−12.0	1872	16
Maryland	Baltimore	58.6	15.9	71.0	1881	− 2.0	1880	16
Massachusetts	Boston	59.1	4.9	66.0	1872	−12.0	1883	17
Michigan	Marquette	42.4	3.9	59.0	1875	−20.0	1880	14
Do	Grand Haven	52.9	4.7	61.0	1877	−12.0	1884	15
Minnesota	Saint Vincent	43.1	−44.1	44.8	1884	−47.8	1884	8
Do	Saint Paul	41.1	−22.4	56.0	1877	−39.0	1879	15
Mississippi	Vicksburg	73.0	21.5	79.0	1873, 1875	10.5	1880	16
Missouri	Saint Louis	58.0	− 2.0	74.0	1875	−17.0	1872	17
Montana	Ft. Assinaboine	52.0	−29.8	67.9	1885	−50.0	1884	8
Do	Helena	54.5	−13.2	56.8	1885	−40.0	1880	7
Nebraska	North Platte	50.0	−18.2	69.0	1885	−25.0	1879	14
Do	Omaha	48.0	−14.5	66.0	1875	−17.0	1879, 1884	15
Nevada	Winnemucca	48.0	1.3	65.0	1878	−20.0	1879	9
New Jersey	Atlantic City	56.0	14.5	64.0	1877	− 6.0	1880	15
New Mexico	Santa Fé	45.0	− 8.0	65.0	1878	−13.0	1879	14
New York	Buffalo	53.0	6.1	62.0	1875	− 9.0	1880	15
Do	New York City	56.4	11.6	66.2	1881	− 2.0	1880	18
North Carolina	Charlotte	62.8	16.3	71.0	1884	− 2.0	1880	10
Do	Wilmington	67.0	19.0	78.0	1879	11.0	1880	17
Ohio	Cincinnati	58.8	1.3	72.0	1875	− 8.0	1872	18
Do	Sandusky	57.9	1.0	63.0	1879	−13.0	1880	11
Oregon	Portland	57.0	28.7	65.4	1886	4.0	1879	15
Do	Roseburg	58.0	26.3	65.8	1886	7.0	1879	11
Pennsylvania	Pittsburg	61.5	7.5	72.8	1885	− 9.0	1880	15
Do	Philadelphia	58.9	14.5	70.0	1873	− 5.0	1880	17
Rhode Island	Block Island	58.0	12.6	60.0	1884	− 3.2	1884	8
South Carolina	Charleston	73.4	29.1	76.0	1881	14.5	1880	15
Tennessee	Knoxville	64.0	13.6	75.0	1874	− 2.0	1880	17
Do	Memphis	62.0	14.5	74.0	1875	3.0	1876	15
Texas	Brownsville	79.1	26.2	92.9	1885	18.0	1880	13
Do	Fort Elliott	61.9	− 3.5	83.0	1880	−10.0	1879	9
Utah	Salt Lake City	49.7	8.7	61.0	1874	− 8.0	1879	14
Virginia	Lynchburg	62.4	12.9	73.0	1873	− 4.0	1880	15
Do	Norfolk	63.7	18.8	73.0	†	6.0	1880	17
Washington	Spokane Falls	53.1	15.2	57.2	1886	−17.8	1884	7
Do	Olympia	55.5	30.0	64.2	1885	8.0	1879	11
Wisconsin	La Crosse	42.5	−21.4	60.0	1877	−28.0	1872	16
Do	Milwaukee	52.7	− 6.9	63.0	1877	−21.6	1884	18
Wyoming	Cheyenne	56.0	−12.8	64.2	1885	−23.0	1879	14

† 1873, 1874, 1875, 1879.

PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada for December, 1887, as determined from the reports of about eight hundred stations, is exhibited on chart iv. In the table of miscellaneous meteorological data are given, for each Signal Service station, the total precipitation, with the departures from the normal. The figures opposite the names of the geographical districts in columns for mean temperature, precipitation, and departures from the normal, show respectively the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the precipitation is below the normal, and subtracting when above.

In all districts east of the one hundredth meridian, with the exception of the lower lake region, Ohio Valley, and New England, the rainfall of December, 1887, was above the normal, the excess being greatest in the Gulf States and lower Rio Grande valley, where the rainfall amounted to from 2 to 3 inches above the normal, the percentage of excess being about 40 per cent. for the east Gulf states, 75 per cent. for the west Gulf states, and about 300 per cent. for the lower Rio Grande valley. A marked excess of rainfall, amounting to about 33 per cent. more than the average, also occurred in the middle and south Atlantic states, and in the Florida Peninsula.

In the lower lake region the deficiency amounts to about 15 per cent. of the average; in the Ohio Valley and Tennessee, about 5 per cent.; the rainfall for New England was normal.

The heaviest rainfalls reported during the month occurred on the north Pacific coast, more than 20 inches having fallen at Neah Bay, Wash., while several stations in that region report from 15 to 17 inches. These heavy rains, however, exceed the average for that region by only about 45 per cent.

Throughout California the rainfall was much below the average; in the northern part of the state but little more than half of the average amount of rain fell, and in the southern part of the state it amounted to about 70 per cent.

DEVIATIONS FROM AVERAGE PRECIPITATION.

The following table shows for certain stations, as reported by voluntary observers, (1) the average precipitation for a series of years; (2) the length of record during which the observations have been taken, and from which the average has been computed; (3) the total precipitation for December, 1887; (4) the departures of the current month from the average; (5) and the extreme monthly precipitation for December during the period of observations and the year of occurrence:

State and station.	County.	(1) Average for the month of Dec.	(2) Length of record.	(3) Total for December, 1887.	(4) Departure from average.	(5) Extreme monthly precipitation for December.			
						Greatest.		Least.	
						Am't.	Year.	Am't.	Year.
Arkansas.		*Inches*	*Years*	*Inches*	*Inches.*	*Inches*		*Inches.*	
Lead Hill	Boone	4.24	6	3.69	−0.55	11.37	1884	1.51	1886
California.									
Fall Brook	San Diego	2.51	11	3.56	+1.05	7.15	1884	0.08	1876
Sacramento	Sacramento	4.52	22	2.89	−1.63	11.56	1880	0.00	1876
Connecticut.									
Canton	Hartford	3.68	26	4.97	+1.29				
Hartford	Hartford	3.78	16	5.88	+2.10				
Middletown	Middlesex	3.78	29	4.86	+1.08				
Wallingford	New Haven	4.21	29	5.18	+0.97				
Illinois.									
Greenville	Bond	4.21	10	4.68	+0.47				
Peoria	Peoria	2.41	32	3.65	+1.24				
Prairieville	Lee	3.93	7	9.02	+5.09				
Rockford	Winnebago	2.22	15	5.01	+2.79				
Riley	McHenry	1.97	27	3.31	+1.34				
Indiana.									
Logansport	Cass	2.64	33	3.80	+1.16	5.99	1881	0.00	1876
Spiceland	Henry	2.90	28	4.16	+1.26	6.50	1884	1.20	1861
Vevay	Switzerland	4.12	21	3.29	−0.83	7.60	1879	1.20	1876
Iowa.									
Cresco	Howard	1.29	14	2.58	+1.29				
Kansas.									
Independence	Montgomery	2.23	15	1.86	−0.37	5.17	1879	0.65	1886
Lawrence	Douglas	1.59	30	2.08	+0.49	4.39	1873	0.43	'76 '80
Wellington	Summan	1.07	9	0.83	−0.24	3.14	1884	0.08	1886

Deviations from average precipitation—Continued.

State and station.	County.	(1) Average for the month of Dec.	(2) Length of record.	(3) Total for December, 1887.	(4) Departure from average.	(5) Extreme monthly precipitation for December.			
						Greatest.		Least.	
						Am't.	Year.	Am't.	Year.
Maine.		*Inches*	*Years*	*Inches*	*Inches.*	*Inches*		*Inches.*	
Cornish	York	4.42	30	2.88	−1.54				
Gardiner	Kennebec	3.82	49	5.61	+1.79	7.55	1878	0.83	1875
Lewiston	Androscoggin	4.50	13	5.73	+1.23				
Orono	Penobscot	4.02	19	4.72	+0.70				
Maryland.									
Cumberland	Alleghany	2.26	16	3.00	+0.74	4.50	1881	0.80	1877
Fallston	Harford	3.56	17	6.40	+2.84	7.02	1878	1.27	1873
McDonogh	Baltimore	3.04	10	2.85	−0.19	4.34	1880	1.16	1882
Massachusetts.									
Amherst	Hampshire	3.55	53	3.47	−0.08				
Cambridge	Middlesex	3.71	47	3.71	0.00				
Lake Cochituate	Middlesex	3.52	36	3.80	+0.28				
Ludlow	Hampden	3.25	12	4.31	+1.06				
Mystic Lake	Middlesex	3.07	12	3.72	+0.65				
New Bedford	Bristol	4.12	75	4.26	+0.16				
Springfield	Hamden	3.52	40	3.81	+0.29				
Waltham	Middlesex	2.97	62	4.13	+1.16				
Nevada.									
Carson City	Ormsby	2.01	9	2.08	+0.07	4.75	1884	0.00	1876
New Brunswick.									
Saint Johns	Saint Johns	4.74	27	6.48	+1.74				
New Hampshire.									
Antrim	Hillsborough	4.13	9	4.01	−0.12	6.60	1881	2.45	1882
Concord	Merrimac	2.81	32	3.62	+0.81				
Hanover	Grafton	2.14	22	3.45	+1.31				
New Jersey.									
Dover	Morris	3.55	5	6.78	+3.23				
New York.									
Boyd's Corners	Putnam	3.78	21	6.71	+2.93				
Factoryville	Tioga	1.50	6	2.00	+0.50	2.73	1884	0.77	1886
Humphrey	Cattaraugus	3.08	4	2.60	−0.48	3.69	1884	2.60	1887
Palermo	Oswego	3.94	34	2.45	−1.49	7.95	1878	1.60	1874
Ohio.									
Wauseon	Fulton	2.37	15	2.69	+0.32	4.32	1879	0.41	1874
Yellow Springs	Greene	2.53	3	3.31	+0.78	3.31	1887	1.59	1885
Pennsylvania.									
Corry	Erie	2.80	3	2.19	−0.61	2.91	1886	2.19	1887
Dyberry	Wayne	2.63	19	4.19	+1.56				
Rhode Island.									
Providence	Providence	3.95	56	4.20	+0.25				
South Carolina.									
Statesburg	Sumter	3.40	7	3.31	−0.09	5.87	1884	1.26	1883
Tennessee.									
Milan	Gibson	4.17	5	3.60	−0.57	7.25	1884	2.22	1886
Texas.									
New Ulm	Austin	4.62	15	4.97	+0.35	16.43	1875	0.44	1880
Vermont.									
Lunenburg	Essex	2.94	38	3.25	+0.31				
Newport	Orleans	2.99	13	3.80	+0.81				
Strafford	Orange	3.20	13	4.20	+1.00	5.90	1878	0.15	1875
Virginia.									
Bird's Nest	Northampton	3.70	19	5.95	+2.25	6.35	1872	1.70	1876
Dale Enterprise	Rockingham	2.05	7	3.14	+1.09	12.63	1885	0.96	1884
Variety Mills	Nelson	3.77	8	4.04	+0.27	6.29	1881	1.80	1880
Wytheville	Wythe	2.94	23	2.91	−0.03	6.00	1871	0.02	1861
West Virginia.									
Helvetia	Randolph	4.56	11	2.81	−1.75	8.81	1881	1.86	1876

HAIL.

Hail fell at scattering stations, mostly in the Northern States and territories, during the month on the following dates: 1st to 3d, 15th, 17th to 24th, 26th, 28th to 31st.

SLEET.

Sleet fell at scattering stations, mostly in the Northern States and territories, during the month on the following dates: 1st to 3d, 7th, 10th to 12th, 15th to 27th, 29th to 31st. It was most frequent on the 31st.

SNOW.

Snow fell on numerous dates during December in all districts north of the thirty-fifth parallel, except on the Pacific coast, where it was less frequent, and where none was reported to the south of the parallel mentioned. In Alabama snow fell on the 26th; in Mississippi on the 24th and 26th; in Louisiana on the 22d and 26th; in Texas on the 11th, 14th to 16th, 18th, 19th, and from the 22d to 25th.

The heavy snow storms of the 18–20th in New York and Pennsylvania, and those of the 29–30th in Illinois, Iowa, Dakota, Minnesota, Wisconsin, and Michigan, caused blockades on railroads in the states mentioned. The snow storms of the 15th and 24th in Texas were of unusual severity for that region, as will be shown by the following reports:

Colorado, Tex., 15th: snow is six inches deep in the streets, and it is very cold.

Denison, Tex., 15th: a light snow, the first of the season, fell at 8 p. m.

Baird, Tex., 15th: the first snow of the season fell here to-day. It has continued to come down all day to the depth of seven inches.

Sherman, Tex., 15th: the first snow in Texas for 1887 fell in this city at 6 p. m. to-day, and is still falling.

Murphysville, Tex., 15th: the heaviest snow storm that has visited this section of Texas for six years fell yesterday and to-day, covering the ground from six inches to a foot. The trains on the Southern Pacific Railroad were detained from one to five hours, and in many cases trains were compelled to double on account of snow drifts in cuts along the line. The storm extends from Del Rio as far west as El Paso and south across the Rio Grande into Mexico. No snow of any importance has fallen here in four years.

Fort Worth, Tex., 15th: a general snow storm, the heaviest in the memory of the oldest settlers, is reported throughout western Texas. At Cisco and San Angelo the snow is six inches deep; at Abilene four inches, and at Sweetwater four inches. It snowed here all the afternoon, but melted as fast as it fell. No loss of cattle is feared unless the snow is followed by a "blizzard."

Palestine, Tex., 23d: rain fell during the afternoon and froze as it fell, coating all exposed objects heavily with ice; at 1.30 a. m. of the 24th the rain changed to snow, which continued until 10.27 a. m. This storm was remarkable for the depth of snow, about nine inches having fallen. Much damage was done to telegraph lines and trees which were weighted with snow and ice.

Jefferson, Tex., 24th: it commenced snowing this morning at 2 o'clock and continued for several hours, covering the ground six inches deep. The weather has moderated considerably this afternoon and the snow is melting fast.

Tyler, Tex., 24th: the heaviest snow seen here for ten years fell last night and morning, amounting to from six to eight inches in depth. The weather cleared off at 10 o'clock and the snow is melting rapidly.

Austin, Tex., 23d: there was a light fall of snow here, lasting all day. The ground was covered this morning with frozen sleet about a quarter of an inch.

MONTHLY SNOWFALLS.

In northern portions of Minnesota and Michigan, in northeastern Iowa, and throughout Wisconsin the monthly snowfalls amounted to 20 inches or more; snowfalls of 20 inches or more also occurred in the northern and central portions of New Hampshise and Vermont, in northeastern New York, and in portions of central and eastern Pennsylvania. With the exception of the northern portions of Illinois, Indiana, and Ohio, and along the immediate coast of the Atlantic, the monthly snowfalls exceeded 10 inches over the whole area north of the fortieth parallel from Missouri Valley eastward.

The following monthly snowfalls of ten inches or more occurred; but in states having less, the maximum amount is also given:

Alabama: Livingston, 2. *Arizona:* Prescott, 7.1. *Arkansas:* Little Rock, 3. *California:* Fort Bidwell, 19.7. *Colorado:* Grand Junction, 6.6. *Connecticut:* North Colebrook, 16.9; Southington, 11. *Dakota:* Richardton, 19; Deadwood, 18.3; Yankton, 18.1; Huron, 15.5; Webster, 14.5. *District of Columbia:* Kendall Green, 6.2. *Idaho:* Boisé City, 2. *Illinois:* Rockford, 28.6; Prairieville, 21.5; Cedarville, 18.7; Lake Forest, 18.4; Oneida and Woodstock, 18; Aurora, 17.2; Riley, 16.5; Aledo, 16.2; Mount Morris and Monmouth, 16; Belvidere, 14; Sterling, 12.5; Oswego, 11.2; Chicago and Fairview, 10.7; Oquawka and Watseka, 10.0. *Indiana:* Angola, 15. *Iowa:* Dubuque, 32; Cresco and Muscatine, 21; Albia, 20.8; Independence, 17.8; Fort Madison, 15.5; Oskaloosa *a*, 13.5; Des Moines, 12.3; Cedar Rapids, 12.2; Oskaloosa *b*, 10. *Kansas:* Leavenworth, 7.6. *Louisiana:* Vidalia, 6. *Maine:* Kent's Hill, 18.2; Cornish, 15.5; Skowhegan, 12.4. *Maryland:* Fallston, 18. *Massachusetts:* Mount Nonotuck, 12.8; Deerfield, 12.5; Amherst *a*, 12.2; Fitchburg, 11.8; Amherst *b*, 10. *Michigan:* Alpena, 43.5; Calumet, 40.5; Central Mine and Snowflake, 37; Big Rapids and Gaylord, 34; Traverse City, 30; Harrisville, 29; Mackinaw City and West Branch, 28.2; Charlevoix, 27; Benzonia, 26.5; Fletcher, 27; Hart, 25; Escanaba, 23.3; Mio, 21.8; Hartford, 21; Greenville, 19.5; Marquette, 19.2; Williamston, 17.5; Grand Rapids, 17.4; Lansing, 17.3; Alma, 17.2; Cassopolis, 15; Hastings, 14.5; Hudson, 13.6; Kalamazoo, 12.5; Marshall, 10.8; Traverse City, 10. *Minnesota:* Minneapolis, 33.1; Moorhead, 20.2; Saint Paul, 16.5. *Mississippi:* Vicksburg, 5.4. *Missouri:* Springfield, 3. *Montana:* Fort Assinaboine, 7.5. *Nebraska:* Hay Springs, 16.5. *Nevada:* Carson City, 13.4. *New Hampshire:* Berlin Mills, 32; North Colebrook, 26; Walpole, 22.2; Plymouth, 19.5; Manchester, 16; Antrim, 15.2; Manchester, 14.7; Nashua, 13.2. *New Jersey:* Dover, 15.5; Beverly, 11.9. *New Mexico:* Fort Stanton, 12. *New York:* Utica, 35; Albany, 27.2; Menands, 21; Saratoga, 18.8; Auburn, 17; Oswego, 16.2; Humphrey, 16; Ardenia, 14.2; Penn Yan, 13.5; Boyd's Corners, Friendship, and White Plains, 13; Cooperstown, 12; Ithaca, 11.5; Factoryville, 11.1; Buffalo, 10.3; Palermo, 10. *Ohio:* Jefferson, 12.9; Pomeroy, 11; Hiram, 10. *Oregon:* Lakeview, 17.7; La Grande, 11.9. *Pennsylvania:* Blooming Grove, 31; Girardville, 27.5; Phillipsburg, 25.6; Easton, 25; Pottstown, 24.5; Quakertown, 22.2; Bethlehem and Dyberry, 22; Drifton, 20; Scranton, 18.2; Lancaster, 16.5; Wysox, 16; State College *a*, 14.6; Grampian Hills, 14.5; Meadville, 13.2; West Chester, 13; Erie, 12; State College *b*, 12.5; Westtown, 11; Wellsborough, 10.5; Catawissa, 10.3; Germantown, 10. *South Carolina:* Stateburg, trace. *Tennessee:* Knoxville, 3.2. *Texas:* Palestine, 9.2. *Utah Territory:* Salt Lake City, 23.7. *Vermont:* Northfield, 43.5; Jacksonville, 31.8; Strafford 31; Burlington, 30; Manchester, 27.5; Cornwall, 26; Brattleborough, 24.8; Chelsea, 23.2; Newport, 23. *Virginia:* Wythville, 7. *Washington Territory:* Spokane Falls, 11.9. *West Virginia:* Middlebrook, 12.5. *Wisconsin:* Green Bay, 35.4; Embarras, 33.8; Fond du Lac, 27; Deuster, 26.9; Manitowoc, 25; Milwaukee, 24.9; Lancaster and Prairie du Chien, 24; Delavan, 21.6; Beloit, 19.3; Franklin, 17; La Crosse, 14.6; Madison, 14. *Wyoming:* Camp Sheridan, 24.1.

DEPTH OF UNMELTED SNOW ON GROUND AT END OF MONTH.

[*Expressed in inches and tenths.*]

At the close of the month there were from 10 to 20 inches of snow on the ground in northern Michigan, Wisconsin, northern Iowa, Minnesota, and in the northern portions of New Hampshire and Vermont. In all districts east of the Rocky Mountains, north of the fortieth parallel, there remained on the ground at the close of the month snow to a depth generally in excess of 2 inches, the greatest depth, 36 inches, being reported from Newport Vt., and Embarras, Wis.

Arizona: Prescott, 0.3. *California:* Fort Bidwell, 9. *Colorado:* Grand Junction, 2.5. *Connecticut:* North Colebrook, 8; Southington, 2; Middletown, trace. *Dakota:* Huron, 15; Webster, 12; Richardton, 8; Fort Totten, 6.5; Yankton, 5.1; Fort Buford, 5; Bismarck, 4; Deadwood, 3; Fort Sully, 2. *District of Columbia:* Washington City, 2. *Idaho:* Boisé City, 0.4. *Illinois:* Jacksonville and Springfield, 2; Chicago, 1; Charleston, 0.1. *Indiana:* Logansport, 3.5; Indianapolis, 0.2; Sunman, trace. *Iowa:* Dubuque, 20; Cresco, 18; Independence 15; Muscatine and Webster City, 12; Cedar Rapids, 10; Albia and Oskaloosa *a*, 9; Oskaloosa *b*, 8; Des Moines and Fort Madison, 4; Keokuk, 3. *Kansas:* East Norway, 2.5; Dodge City and Concordia, 1; Globe and Libo, drifts; Topeka, Wakefield, Wellington, and Yates Centre, trace. *Maine:* Cornish, 12.5; Skowhegan, 8; Orono, 2; Gardiner, 1.5; Eastport, 0.7. *Maryland:* Fallston, 4; Cumberland, 2; Baltimore, 1. *Massachusetts:* Deerfield, 6; Mount Nonotuck and Fitchburg, 5; Amherst, 4; Gilbertville, 3; Lowell, 2; Newburyport, 1; Blue Hill Observatory, trace. *Michigan:* Central Mine and Gaylord, 36; Charlevoix, 30; West Branch, 26; Traverse City and Fletcher, 24; Benzonia and Hillman, 18; Alpena and Big Rapids, 16; Snowflake and Mackinaw City, 15; Marquette, 14; Sault Saint Marie, 12; Mio, 11.5; Greenville, 11; Grand Rapids, 10; Grand Haven, 9.3; Hudson, 9; Buchanan, Alma, and Hartford, 8; Escanaba, Ovid, and Olivet, 7; Petersburg, Bad Axe, Kalamazoo, and Cassopolis, 6; Adrian, Mottville, Mount Morris, Thornville, and Hanover, 4; Lansing, Williamston, Hastings, and Jonesville, 3; Madison, Sand Beach, Port Huron, Lansing (State Capitol), Concord, and Coldwater, 2. *Minnesota:* Minneapolis, 20; Saint Paul and Duluth, 18; Moorhead, 11; Saint Vincent, 5. *Missouri:* Frankford, 1.5; Fayette, 1; Conception, 0.1. *Montana:* Fort Assinaboine, 6; Helena, 3; Poplar River, 2; Fort Maginnis, 1.1. *Nebraska:* Hay Springs, 10; Marquette, 5; University of Nebraska, De Soto, Omaha, and Valentine, 4; Brownville and Genoa, 3; Crete, North Platte, and Tecumseh, 2. *Nevada:* Carson City, 5; Winnemucca, 3.

New Hampshire: Walpole, 20; North Conway and Plymouth, 12; Manchester, 5; Nashua, 3. *New Jersey:* Dover, 5; Beverly and Egg Harbor City, 2; Vineland, 1.5; Moorestown, 1. *New Mexico:* Fort Stanton, 2.5. *New York:* Utica, 15.2; Menands, 15; Auburn, 13; Albany, 12; North Volney, 10; Cooperstown and Humphrey, 8; Ardenia and Palermo, 6; Factoryville, Oswego, and Penn Yan, 5; Buffalo, Friendship, and Ithaca, 4; Boyd's Corners, 3; Rochester, 2; New York, 1.3. *Ohio:* Sandusky, 5; Hiram and Wauseon, 4; Garrettsville and Tiffin, 3; Napoleon and Toledo, 2; Columbus, trace. *Oregon:* Lakeview, 7; La Grande, 5. *Pennsylvania:* Blooming Grove, 15; Drifton and Dyberry, 12; Quakertown, 9.5; Phillipsburg, 7; Erie, State College, and West Chester, 4; Corry, 3 to 4; Wellsborough, 3.1; Westtown, 3; Philadelphia, 2.6; Meadville, 2; Wilkesbarre, 1. *Utah:* Salt Lake City, 7.3; Frisco, 5. *Vermont:* Northfield, 36; Cornwall, 26; Burlington, Manchester, and Strafford, 20; Chelsea, 19; Jacksonville, 18; Newport, 15; Brattleborough, 14. *Virginia:* University of Virginia, 2.5; Variety Mills, 2; Lynchburg, 0.4; Wytheville, 0.2. *Washington Territory:* Spokane Falls, 4; Walla Walla, 1. *West Virginia:* Middlebrook, 4. *Wisconsin:* Embarras, 36; Green Bay, 26; Deuster, 24; Manitowoc, 18; Franklin and Lancaster, 16; Fond du Lac, 15; Milwaukee, 14; Delavan, 12.9; La Crosse, 12; Prairie du Chien 11; Beloit, 9.5. *Wyoming:* Camp Sheridan, 8.6; Fort Bridger, 0.5.

Excessive precipitation for the month of December, 1887.

States and stations.	Monthly, 6 inches, or more.*	Specially heavy.					
		2 inches, or more, per day.			At rate of 1 inch, or more, per hour.		
		Am't.	Duration.	Date.	Am't.	Duration.	Date.
			h. m.			h. m.	
Alabama.							
Mount Willing	15.95	.....	.....	.....	.....	.....	.....
Trinity	14.00	5.20	.....	4	.....	.....	.....
Auburn	13.84	3.16	.....	9	.....	.....	.....
Tuscaloosa	11.64	2.74	.....	7	.....	.....	.....
Gadsden	11.10	2.95	.....	9	.....	.....	.....
Talladega	10.48	2.10	.....	7	.....	.....	.....
Mount Vernon	9.92	2.00	.....	19, 20	.....	.....	.....
Do	.....	2.00	.....	23	.....	.....	.....
Livingston	9.65	3.14	.....	7, 8	.....	.....	.....
Oswichee	8.58	2.00	.....	31	.....	.....	.....
Carrollton	8.26	3.10	.....	31	.....	.....	.....
Montgomery	8.25	.....	.....	.....	.....	.....	.....
Newton	8.00	.....	.....	.....	.....	.....	.....
Valley Head	7.88	3.00	.....	31	.....	.....	.....
Union Springs	7.83	2.71	.....	8	.....	.....	.....
Mobile	7.21	.....	.....	.....	.....	.....	.....
Bermuda	6.74	.....	.....	.....	.....	.....	.....
Florence	6.04	2.00	.....	31	.....	.....	.....
Arkansas.							
Hot Springs	11.16	6.92	47 30	1–3	.....	.....	.....
Little Rock	7.14	2.31	12 30	3, 4	.....	.....	.....
British Columbia.							
New Westminster	11.40	2.50	.....	11	.....	.....	.....
California.							
Fort Gaston	8.36	.....	.....	.....	.....	.....	.....
Florida.							
Tallahassee	8.35	3.30	.....	16	.....	.....	.....
Pensacola	6.89	2.02	19 30	23, 24	.....	.....	.....
Georgia.							
Quitman	9.55	3.90	20 15	16	.....	.....	.....
Savannah	7.99	3.37	17 00	24	.....	.....	.....
Forsyth	7.56	2.15	12 00	23, 24	.....	.....	.....
Andersonville	6.82	.....	.....	.....	.....	.....	.....
Idaho.							
Sherman, Fort	6.66	.....	.....	.....	.....	.....	.....
Indiana.							
Marengo	7.23	2.50	.....	31	.....	.....	.....
Crawfordsville	.....	2.00	.....	31	.....	.....	.....
Seymour	.....	2.00	.....	31	.....	.....	.....
Louisiana.							
New Iberia	8.26	.....	.....	.....	.....	.....	.....
Monroe	7.98	.....	.....	.....	.....	.....	.....
Grand Coteau	7.80	.....	.....	.....	.....	.....	.....
New Orleans	7.56	2.00	.....	23, 24	.....	.....	.....
Liberty Hill	7.48	.....	.....	.....	.....	.....	.....
Mandeville	7.33	.....	.....	.....	.....	.....	.....
Shreveport	6.72	3.18	*22 50	6, 7	.....	.....	.....
Donaldson	6.62	.....	.....	.....	.....	.....	.....
Delta	6.56	.....	.....	.....	.....	.....	.....
Maine.							
Gardiner	.....	2.24	.....	10, 11	.....	.....	.....
Portland	.....	2.01	.....	11	.....	.....	.....
Maryland.							
Fallston	6.40	.....	.....	.....	.....	.....	.....
New Midway	6.05	.....	.....	.....	.....	.....	.....
Massachusetts.							
Deerfield	.....	2.52	12 00	27	.....	.....	.....
Nantucket	.....	2.20	†24 00	11, 12	.....	.....	.....

Excessive precipitation, etc.—Continued.

States and territories.	Monthly, 6 inches, or more.	Specially heavy.					
		2 inches, or more, per day.			At rate of 1 inch, or more, per hour.		
		Am't.	Duration.	Date.	Am't.	Duration.	Date.
			m. h.			h. m.	
Mississippi.							
Biloxi	10.13	2.26	8 00	13, 14	.....	.....	.....
Vicksburg	7.07	.....	.....	.....	.....	.....	.....
Oxford	6.32	.....	.....	.....	.....	.....	.....
New Jersey.							
Lambertville	7.32	2.10	.....	17, 18	.....	.....	.....
Dover	6.78	2.04	.....	18	.....	.....	.....
Newton	6.63	2.64	.....	31	.....	.....	.....
Trenton	6.33	.....	.....	.....	.....	.....	.....
Locktown	6.01	.....	.....	.....	.....	.....	.....
Imlaystown	6.00	.....	.....	.....	.....	.....	.....
Paterson	.....	2.40	.....	11, 12	.....	.....	.....
Tenafly	.....	2.00	.....	11, 12	.....	.....	.....
New York.							
Boyd's Corners	6.71	.....	.....	.....	.....	.....	.....
White Plains	6.40	.....	.....	.....	.....	.....	.....
North Carolina.							
Southport	7.78	.....	.....	.....	.....	.....	.....
Hatteras	6.96	3.10	†24 00	10	.....	.....	.....
Chapel Hill	6.19	2.90	.....	8, 9	.....	.....	.....
Ohio.							
West Milton	6.50	.....	.....	.....	.....	.....	.....
New Bremen	.....	2.00	.....	31	.....	.....	.....
Oregon.							
Yaquima Light-house	17.91	8.47	.....	5–6	.....	.....	.....
Do	.....	2.66	.....	25	.....	.....	.....
Astoria	16.64	3.17	24 00	6, 7	.....	.....	.....
Bandon	14.54	6.44	.....	4–7	.....	.....	.....
Do	.....	2.51	.....	28	.....	.....	.....
Albany	14.21	4.98	.....	5, 6	.....	.....	.....
Do	.....	2.32	.....	25, 26	.....	.....	.....
Portland	11.34	2.22	24 00	6	.....	.....	.....
East Portland	12.10	.....	.....	.....	.....	.....	.....
Roseburg	8.89	.....	.....	.....	.....	.....	.....
Pennsylvania.							
Germantown	7.15	.....	.....	.....	.....	.....	.....
West Chester	6.81	2.01	.....	10, 11	.....	.....	.....
Pottstown	6.50	2.00	.....	18	.....	.....	.....
Westtown	6.41	.....	.....	.....	.....	.....	.....
Quakertown	6.05	.....	.....	.....	.....	.....	.....
Easton	6.01	.....	.....	.....	.....	.....	.....
Blooming Grove	.....	2.00	.....	18	.....	.....	.....
Chamberaburg	.....	2.50	.....	17	.....	.....	.....
South Carolina.							
Charleston	7.91	3.08	24 00	23, 24	.....	.....	.....
Hardeeville	6.22	3.54	.....	24	.....	.....	.....
Tennessee.							
Fostoria	8.70	3.00	.....	31	.....	.....	.....
Cookeville	8.38	2.97	.....	31	.....	.....	.....
Lawrenceburg	7.45	3.88	.....	31	.....	.....	.....
Savannah	6.45	2.58	.....	31	.....	.....	.....
Nashville	.....	2.24	7 00	31	.....	.....	.....
Riddleton	.....	2.86	.....	31	.....	.....	.....
Hohenwald	.....	2.54	.....	31	.....	.....	.....
Florence Station	.....	2.96	.....	31	.....	.....	.....
Ashwood	.....	2.70	.....	31	.....	.....	.....
Waynesborough	.....	2.20	.....	31	.....	.....	.....
Texas.							
Galveston	10.28	2.90	†24 00	23	.....	.....	.....
Palestine	6.72	.....	.....	.....	.....	.....	.....
Rio Grande City	.....	2.55	24 00	12	.....	.....	.....
Brownsville	.....	2.07	†24 00	23	.....	.....	.....
Vermont.							
Manchester	6.09	.....	.....	.....	.....	.....	.....
Northfield	.....	2.14	24 00	28, 29	.....	.....	.....
Washington Territory.							
Neah Bay	22.57	2.83	.....	4	.....	.....	.....
Do	.....	2.00	.....	6	.....	.....	.....
Do	.....	2.20	.....	11	.....	.....	.....
Do	.....	5.45	.....	16, 17	.....	.....	.....
Do	.....	3.56	.....	25, 26	.....	.....	.....
Tatoosh Island	17.47	2.24	.....	16	.....	.....	.....
Do	.....	2.43	.....	25, 26	.....	.....	.....
Olympia	15.75	3.85	20 00	6, 7	.....	.....	.....
Fort Canby	15.18	2.17	24 00	24, 25	.....	.....	.....
Vashon	10.67	3.80	.....	6, 7	.....	.....	.....
Do	.....	2.00	.....	11	.....	.....	.....
Tacoma	10.26	3.04	.....	6, 7	.....	.....	.....
Blakely	7.89	2.50	.....	6	.....	.....	.....
Port Angeles	6.09	.....	.....	.....	.....	.....	.....

*Less than 22 h. 50 m. † Less than 24 hours.

HEAVY RAINFALLS AT NEW YORK CITY.

In connection with the subject of heavy rainfalls, Prof. Daniel Draper, Director of the Central Park Meteorological Observatory, New York City, at the request of the Chief Signal Officer, has kindly furnished the following table, compiled from the records of the self-registering rain-gauge of the Central Park Observatory.

The following record shows that in the nineteen years of observation rains have fallen at the rate of one inch, or more, per hour in sixty-six instances, thus giving an average of about three and one-half of such rainfalls per year. During this

period rainfalls at the rate of one inch, or more, per hour were most frequent in 1882, in which year seven instances are recorded, while the years 1869 and 1886 had but one each:

Table showing (1) rainfalls of one inch, or more, per hour, and also the fractional part of an inch of rain in a few minutes, which would be equivalent to more than one inch per hour; (2) the duration; (3) the rate of fall per hour; (4) the duration of, and amount of water for, each storm, in which these heavy rainfalls occurred.

Dates.	Actual rate.	Time.	Rate per hour.	For storm.	
	Inches.	*Min.*	*Inches.*	*H. M.*	*Inch.*
August 13, 1869	.50	10	3.00	1 05	.63
June 27, 1870	.50	15	2.00	1 45	.93
July 28, 1870	.45	10	2.70	3 15	1.01
June 7, 1871	.50	10	3.00	6 00	1.87
July 16, 1871	1.00	20	3.00	2 40	1.50
July 28, 1871	.50	10	3.00	7 30	.60
August 16, 1871	.50	10	3.00	5 05	.70
October 11, 1871	.50	10	3.00	3 50	1.58
October 27, 1871	.50	15	2.00	11 45	1.32
July 4, 1872	.50	25	1.20	6 45	1.20
July 15, 1872	.60	15	2.40	7 50	1.57
July 25, 1872	.50	20	1.50	8 30	2.91
August 10, 1872	.50	20	1.50	1 20	.54
October 25, 1872	.43	20	1.29	9 15	1.56
July 5, 1873	.65	10	3.90	4 20	.94
July 27, 1873	.50	05	6.00	19 00	1.36
August 21, 1873	1.00	60	1.00	13 00	4.15
August 30, 1873	.50	20	1.50	3 00	.77
August 31, 1873	.49	25	1.20	45	.50
July 10, 1874	.50	15	2.00	4 10	1.74
July 12, 1874	.80	30	1.60	1 00	.83
June 23, 1875	.45	20	1.35	3 30	.72
July 26, 1875	.69	15	2.76	6 00	1.87
August 12, 1875	.50	20	1.50	5 50	2.63
August 18, 1875	.90	30	1.80	9 00	1.91
August 17, 1876	1.00	20	3.00	8 20	2.06
June 21, 21, 1877	1.00	60	1.00	5 00	1.33
July 3, 1877	.40	05	4.80	3 00	.54
July 17, 1877	.50	05	6.00	5 00	2.91
October 4, 1877	1.50	60	1.50	19 30	4.05
June 22, 1878	.50	20	1.50	7 00	1.20
August 1, 1878	1.00	30	2.00	18 00	2.85
August 6, 1878	2.50	30	5.00	1 20	2.66
September 5, 1878	1.00	60	1.00	5 00	2.44
June 15, 1879	.50	30	1.00	1 00	.54
August 25, 1879	.50	20	1.50	11 00	1.00
July 11, 1880	.50	30	1.00	2 00	.56
July 13, 1880	1.00	15	4.00	6 00	1.35
July 27, 1880	.50	10	3.00	30	.51
August 21, 1880	.95	45	1.29	1 30	.97
August 25, 1880	1.00	60	1.00	2 45	1.17
May 22, 1881	1.15	10	6.90	50	1.21
July 4, 1881	.50	20	1.50	5 45	.80
June 15, 1882	.35	10	2.10	2 10	.36
June 19, 1882	.50	20	1.50	5 30	.80
June 26, 1882	.50	10	3.00	1 30	.56
September 11, 1882	1.08	60	1.08	22 50	2.57
September 21, 1882	.45	08	3.38	8 60	1.20
September 22, 1882	1.00	25	2.40	13 15	2.34
September 23, 1882	1.90	60	1.90	19 30	8.28
May 21, 1883	1.70	60	1.70	14 00	2.18
June 6, 1883	.44	05	5.28	45	.45
July 13, 1883	.75	15	3.00	1 20	.83
June 25, 1884	1.00	60	1.00	11 30	4.74
July 12, 1884	.40	10	2.40	10 30	1.60
August 5, 1884	.45	05	5.40	9 20	1.44
August 22, 1884	1.30	30	2.60	5 50	1.83
August 20, 1884	.90	30	1.80	16 15	1.06
June 5, 1885	.30	03	6.00	45	.38
August 3, 1885	.75	20	2.25	17 15	2.47
November 18, 1886	.25	02	7.50	6 00	.49
June 1, 1887	1.00	30	2.00	9 30	2.60
June 20, 1887	.50	20	1.50	3 30	.57
June 22, 1887	.50	15	2.00	7 30	1.66
August 18, 1887	.43	05	5.16	45	.44
August 22, 1887	.50	30	1.00	8 10	1.09

The table below shows the number of times rainfalls ranging from one inch to more than six inches per hour have occurred at Central Park in nineteen years, with the average rate per hour and the average duration:

Amount, in inches.	Number of occurrences.	Average rate per hour.	Average actual rate.	Average duration.
		Inches.	*Inch.*	*Minutes.*
1 to 2	29	1.35	0.78	36
2 to 3	14	2.25	0.68	18
3 to 4	12	3.11	0.62	12
4 to 5	2	4.40	0.70	10
5 to 6	4	5.21	0.96	11
6 or more	5	6.48	0.54	5

NOTE.—It will be understood from the preceding table that there were *not* twenty-nine cases in which there was an average hourly rainfall of 1.35 inches, but that there were twenty-nine cases in which rain fell at a rate which would have given that result had the rain continued for one hour. The average duration of these twenty-nine rains being thirty-six minutes, the average actual rainfall was 0.78 inch.

Actual rainfalls of one inch, or more, in one hour, or less, occurred eighteen times in the nineteen years, the amount of rain aggregating 22.13 inches for a total duration of twelve hours and thirty minutes. The average of these actual rainfalls was 1.23 inches for each forty-two minutes, or at a rate of about 1.80 inches per hour. It may therefore be stated that during the nineteen years there has been an average of one storm per year in which there was an actual fall of rain in excess of one inch for a shorter period than one hour.

Table showing for the month of December monthly rainfalls of 10 inches, or more; rainfalls of 2.50 inches, or more, in any 24 consecutive hours; and rainfalls equaling or exceeding one inch in one hour.

States and stations.	Rainfall of 10 inches, or more, per month.		Rainfall of 2.50 inches, or more, in 24 hours.			Rainfall equaling or exceeding one inch per hour.			
	Year.	Amt.	Year.	Day.	Amt.	Year.	Day.	Time	Amt.
Alabama.		*Inches*			*Inches*			*h. m.*	*Inches*
Mobile			1876	21	2.72	1879	5	0 35	1.00
Do			1885	13	4.18				
Mount Willing	1887	15.95							
Trinity	1887	14.60	1887	4	5.20				
Auburn	1887	13.84	1887	9	3.16				
Tuscaloosa	1887	11.64	1887	7	2.74				
Gadsden	1887	11.10	1887	9	2.95				
Talladega	1887	10.48							
Arkansas.									
Little Rock	1884	16.92							
California.									
Los Angeles			1878	31	3.58	1877	17	1 00	1.00
Do			1879	19-20	4.34	1884	25	1 00	1.00
Do			1884	25-26	3.04				
Red Bluff	1880	12.85	1881	4	2.89				
Sacramento	1880	11.81	1880	2	2.58				
Do	1884	10.45	1885	21	2.81				
Salinas			1872	24	3.20				
San Francisco			1871	18	2.83				
Do			1871	18-19	3.14				
Do			1871	19	3.12				
Do			1885	21	2.78				
San Diego			1873	4	2.52				
Do			1879	27-28	2.55				
Florida.									
Cedar Keys			1884	5	3.73				
Jacksonville			1885	9-10	4.43				
Key West			1870	20-21	3.00				
Do			1879	11-12	3.93				
Pensacola			1681	21	4.17				
Do			1885	13	4.23				
Georgia.									
Atlanta			1879	13-14	4.12				
Do			1884	14	3.74				
Savannah			1880	6	3.01				
Do			1885	9-10	3.66				
Do			1887	23-24	3.71				
Illinois.									
Cairo			1879	23-24	2.75	1871	31	1 00	1.25
Do			1887	27-28	3.05				
Louisville			1873	3	5.70				
Peoria			1850	9	2.62				
Springfield			1881	13	3.33				
Chicago			1871	22-23	2.50				
Indiana.									
Indianapolis			1873	3	3.46	1873	3	1 00	1.30
Do						1874	27	1 00	1.00
Iowa.									
Keokuk			1873	11	2.61				
Kentucky.									
Louisville			1873	3	3.87				
Do			1875	24	2.84				
Do			1878	23-24	2.70				
Louisiana.									
New Orleans			1872	18	2.54				
Do			1875	4	3.82				
Do			1877	31	2.59				
Do			1881	13-14	2.32				
Do			1885	12-13	3.40				
Shreveport	1884	15.55	1872	15	2.53	1884	11	1 00	2.00
Do			1875	21	4.66				
Do			1881	13	3.56				
Do			1884	27	2.83				
Do			1884	28	4.08				
Do			1884	29	3.78				
Maine.									
Portland			1877	25-26	3.76				
Do			1878	9-10	2.58				
Maryland.									
Baltimore			1878	10	2.85				
Massachusetts.									
Boston			1878	10	2.58				
Nantucket						1887	12	1 00	1.00
Michigan.									
Mackinaw City			1883	20-21	4.50				
Mississippi.									
Biloxi	1887	10.13							
Vicksburg	1872	10.33	1872	18-19	5.05				
Do	1884	13.52	1876	23-24	3.70				
Do			1882	19-20	3.78				
Do			1883	29-30	4.51				
Do			1884	29	4.07				

Table showing for the month of December, &c.—Continued.

States and stations.	Rainfall of 10 inches, or more, per month.		Rainfall of 2.50 inches, or more, in 24 hours.			Rainfall equaling or exceeding one inch per hour.			
	Year.	Amt.	Year.	Day.	Amt.	Year.	Day.	Time.	Amt.
		Inches.			*Inches*			*h. m.*	*Inches*
Missouri.									
Saint Louis	.....	.....	1873	2–3	2.61	.....	....	.....	.....
New Hampshire.									
Mount Washington	1881	15.95	.....	.....	.....	.....	....	.....	.....
New York.									
Buffalo	.....	.....	1878	22–23	2.53	.....	....	.....	.....
Oswego	1878	10.49	1878	10	2.63	.....	....	.....	.....
Do	.....	.....	1878	10–11	2.81	.....	....	.....	.....
Cooper Union	.....	.....	1874	20	5.00	.....	....	.....	.....
North Carolina.									
Charlotte	.....	.....	1879	13–14	2.52	.....	....	.....	.....
Hatteras	1877	13.38	1877	5	2.60	1877	29	1 15	1.13
Do	1878	10.20	1877	19	4.17	.....	....	.....	.....
Do	.....	.....	1877	26	3.72	.....	....	.....	.....
Do	.....	.....	1882	30	2.82	.....	....	.....	.....
Do	.....	.....	1886	5	2.65	.....	....	.....	.....
Do	.....	.....	1887	10	3.10	.....	....	.....	.....
Ohio.									
Kenton	.....	.....	1873	3–4	2.75	.....	....	.....	.....
Cincinnati	.....	.....	1873	12–13	2.75	.....	....	.....	.....
Do	.....	.....	1880	4–5	3.10	.....	....	.....	.....
Do	.....	.....	1883	23–24	2.60	.....	....	.....	.....
Oregon.									
Albany	1887	14.21	.....	.....	.....	.....	....	.....	.....
Astoria	1875	19.49	1875	31	3.57	.....	....	.....	.....
Do	1886	16.86	1887	6–7	3.17	.....	....	.....	.....
Do	1887	16.64	.....	.....	.....	.....	....	.....	.....
East Portland	1887	12.10	.....	.....	.....	.....	....	.....	.....
Newport	1887	17.91	.....	.....	.....	.....	....	.....	.....
Portland	1875	13.41	1875	30–31	3.13	.....	....	.....	.....
Do	1880	13.93	.....	.....	.....	.....	....	.....	.....
Do	1882	20.14	1877	9–10	3.15	.....	....	.....	.....
Do	1886	11.52	.....	.....	.....	.....	....	.....	.....
Do	1887	11.34	1881	12–13	7.66	.....	....	.....	.....
Roseburg	.....	.....	1879	4	2.86	.....	....	.....	.....
Do	.....	.....	1883	24–25	2.50	.....	....	.....	.....
Do	.....	.....	1884	16–17	2.53	.....	....	.....	.....
South Carolina.									
Charleston	.....	.....	1873	25	2.54	.....	....	.....	.....
Do	.....	.....	1885	9–10	3.46	.....	....	.....	.....
Do	.....	.....	1887	23–24	3.08	.....	....	.....	.....
Hacienda Saluda	.....	.....	1875	27–29	5.00	.....	....	.....	.....
Tennessee.									
Chattanooga	.....	.....	1879	10–11	3.10	.....	....	.....	.....
Do	.....	.....	1880	1	3.08	.....	....	.....	.....
Do	.....	.....	1881	21–22	3.08	.....	....	.....	.....

Table showing for the month of December, &c.—Continued.

States and stations.	Rainfall of 10 inches, or more, per month.		Rainfall of 2.50 inches, or more, in 24 hours.			Rainfall equaling or exceeding one inch per hour.			
	Year.	Amt.	Year.	Day.	Amt.	Year.	Day.	Time.	Amt.
		Inches.			*Inches*			*h. m.*	*Inches*
Tennessee—Continued.									
Knoxville	.....	.....	1872	19–20	3.48	1873	4	0 45	1.10
Do	.....	.....	.....	.....	.....	1875	26	0 30	1.03
Memphis	.....	.....	1884	29–30	3.09	.....	....	.....	.....
Texas.									
Clarksville	1874	10.25	1875	23	3.00	.....	....	.....	.....
Do	.....	.....	1876	28–29	8.50	.....	....	.....	.....
Galveston	1887	10.28	1875	21–22	4.63	1871	28	0 20	1.36
Do	.....	.....	1878	19–20	4.74	1885	13	1 15	1.02
Do	.....	.....	1882	18–19	2.72	.....	....	.....	.....
Do	.....	.....	1884	28	4.50	.....	....	.....	.....
Do	.....	.....	1887	23–24	2.90	.....	....	.....	.....
Gilmer	.....	.....	1875	20–21	3.17	.....	....	.....	.....
New Ulm	1875	16.40	1875	3	5.62	.....	....	.....	.....
Do	.....	.....	1875	21	3.12	.....	....	.....	.....
Do	.....	.....	1875	24	2.63	.....	....	.....	.....
Do	.....	.....	1875	31	2.75	.....	....	.....	.....
Virginia.									
Lynchburg	1884	11.81	1879	13	3.17	.....	....	.....	.....
Do	.....	.....	1883	22	4.50	.....	....	.....	.....
Do	.....	.....	1884	21	6.74	.....	....	.....	.....
Norfolk	.....	.....	1872	25–26	2.85	.....	....	.....	.....
Washington.									
Canby, Fort	1885	10.56	1884	18	2.77	.....	....	.....	.....
Do	1886	17.35	1886	30–31	2.58	.....	....	.....	.....
Do	1887	15.18	.....	.....	.....	.....	....	.....	.....
Neah Bay	1883	11.83	.....	.....	.....	.....	....	.....	.....
Do	1885	13.00	.....	.....	.....	.....	....	.....	.....
Do	1886	30.70	.....	.....	.....	.....	....	.....	.....
Olympia	1877	11.73	1878	1	3.60	.....	....	.....	.....
Do	1879	11.42	1879	30–31	3.31	.....	....	.....	.....
Do	1880	16.66	1884	18–19	3.32	.....	....	.....	.....
Do	1882	10.32	1886	30–31	2.50	.....	....	.....	.....
Do	1886	13.38	1887	6–7	3.82	.....	....	.....	.....
Do	1887	15.75	.....	.....	.....	.....	....	.....	.....
Pysht	1883	11.34	.....	.....	.....	.....	....	.....	.....
Do	1886	21.61	.....	.....	.....	.....	....	.....	.....
Tacoma	1887	10.26	.....	.....	.....	.....	....	.....	.....
Tatoosh Island	1883	10.45	1884	19–20	2.68	.....	....	.....	.....
Do	1884	12.47	1884	20–21	2.85	.....	....	.....	.....
Do	1885	10.14	1886	2–3	2.95	.....	....	.....	.....
Do	1886	25.84	1886	11–12	4.02	.....	....	.....	.....
Do	1887	17.47	1886	12–13	2.90	.....	....	.....	.....
British Columbia.									
New Westminster	1887	11.40	.....	.....	.....	.....	....	.....	.....

WINDS.

The most frequent directions of the wind during December, 1887, are shown on chart ii, by arrows flying with the wind. They were from north or northwest in the Missouri Valley, New England, the middle Atlantic, and west Gulf states; from west or southwest in the Lake region and northern slope; from north, northeast, or east in the south Atlantic and east Gulf states, and in other districts variable.

HIGH WINDS (in miles per hour).

The maximum velocities of wind for December, 1887, at Signal Service stations where the movements are registered, are given in the table of miscellaneous meteorological data. Other than the maximum velocities given in this table, the following have been reported: Mackinaw City, Mich., 59, e., 3d. Block Island, R. I., 55, n., 3d; 58, nw., 28th. Fort Canby, Wash., 66, se., and 72, s., 4th; 72, s., 6th; 52, s., 8th; 64, s., 9th; 72, s., 11th; 56, sw., 26th. Fort Maginnis, Mont., 32, nw., 7th.

LOCAL STORMS.

With the exception of the storm which occurred in the vicinity of Los Angeles, Cal., during the 13–14th, and that which occurred in the Indian Territory on the 18th, no well-defined local storms are reported to have occurred during December. The following are, for the most part, reports of storms which occurred in connection with some of the more important areas of low pressure, the paths of the centres of which are traced on chart i:

Fort Sully, Dak.: light and heavy snow fell alternately during the night of the 2–3d and continued throughout the following day, with high westerly winds, which reached a maximum velocity of forty-three miles per hour. A similar storm occurred on the 31st, reaching a velocity of thirty-six miles per hour; this was the worst storm of the season, and caused the delay of trains from twenty to twenty-four hours.

Los Angeles, Cal.: a severe storm set in from the north and east at 4 a. m. on the 13th, and continued until 9.45 a. m. on the following day; the most violent part of the storm occurred between 6.30 and 9.45 a. m. on the 14th, during which time the wind blew at an average rate of thirty-six miles, the maximum velocity being fifty miles per hour. The damage in this city was slight, but reports from the surrounding country state that the storm was very destructive, especially along the line of the Sierra Madre foot-hills, where many buildings were demolished and orchards in many places were badly injured. At Crescenta Canada, a small town twelve miles north of this place, a hotel was destroyed, resulting in the death of two persons.

The "Los Angeles Herald" of the 15th contained the following in connection with the storm above referred to:

At Glendora, several cottages were blown down; no one injured. At Paquima, in the San Fernando Valley, the new hotel was almost demolished; loss $5,000. At Lordsburg, the hotel recently erected was torn to pieces; loss $10,000. At Rialto, three houses destroyed. At Pasadena, several houses blown down on exposed points, and quite a number of persons injured. At Cucamonga, the depot almost totally destroyed; also the new hotel and several stores and buildings; loss about $50,000. At San Bernardino, several cottages wrecked. At San Fernando the roof of the brick warehouse was blown off and deposited on the middle of the Southern Pacific track. Between Cucamonga and Colton the cab was blown off the engine of a special eastbound freight train. At Colton the channel of the water ditch was so filled with sand which had drifted before the wind that it was impossible to obtain any water. At Riverside much damage was done in exposed districts.

Wall Street, Linn Co., Kans.: snow began falling at 2 p. m. on the 19th, and at 7.30 p. m. the storm became very severe, the wind blowing in short puffs of unusual violence, while at intervals there were perfect calms. The storm continued during the night, and at 6.15 a. m. on the 20th, with a temperature of 2° below zero, it raged with great violence; the snow drifted so that roads were impassable. The storm suddenly subsided at 6 p. m.

Los Angeles, Cal: during the evening of the 21st a brisk northeast wind prevailed; maximum velocity twenty-four miles per hour. Reports state that in the surrounding country considerable damage was done by the wind; a number of houses were demolished in the Santa Anna Valley, and in the San Bernardino district.

Northfield, Vt.: high northeast to northwest winds prevailed during the 16th; a maximum velocity of forty miles per hour from northwest was recorded at 10.55 a. m.

Hatteras, N. C.: a gale began at 11 a. m. of the 17th, and continued during the remainder of the day; maximum velocity, forty-eight miles per hour from the west, at 8.05 p. m.

Boston, Mass.: high easterly winds prevailed from midnight of the 18th until 3.43 a. m., when a maximum velocity of fifty-six miles was recorded, after which time the wind abated.

Several newspapers published accounts of a storm which occurred during the early morning of the 17th at Armstrong Academy and Fort Washita, in the Indian Territory, near the Texas border. The following extract from the "New York Herald" of the 19th relates to this storm, which appears to have been a well-defined tornado:

LITTLE ROCK, ARK., *December* 18, 1887.—A special from Cove, Polk Co., reports that a destructive cyclone visited Armstrong Academy, Ind. T., Fort Washita, and Green, at an early hour on Saturday (17th) morning, causing great destruction of property and loss of life. A terrible rumbling sound was heard about five o'clock. A heavy black cloud, funnel-shaped, was seen in the distance and rapidly approaching. When about a mile north of Fort Washita it struck the ground, and from that point south for miles the work of ruin was continued. The cyclone traveled at the rate of about a mile a minute. In an instant from the time it struck the earth half the houses in Fort Washita were in ruins. Armstrong Academy was not greatly injured, but ranches in the immediate neighborhood suffered greatly. At Green, a little hamlet six miles south of Armstrong, the damage was very heavy and many persons were injured. Seventeen houses and a general store were carried away bodily, while horses and cattle within the territory covered by the storm were killed or maimed. Two children killed at Green were carried about sixty yards by the wind and dashed to the ground, mangled so as to be almost unrecognizable. Many cattle and other stock were also killed by lightning. The storm only lasted about six minutes at any one point.

Omaha, Nebr.: northwesterly winds prevailed from 9.15 p. m. on the 19th to 11.05 p. m. on the 20th; maximum velocity, forty-two miles per hour.

Cairo, Ill.: a strong gale, accompanied by severe cold, prevailed from noon until 2 p. m. of the 20th; maximum velocity, forty-eight miles per hour.

Wood's Holl, Mass.: a maximum wind-velocity of fifty-eight miles per hour was recorded at 4.30 p. m. on the 22d. The storm began during the forenoon and ended at 9 p. m.

New London, Conn.: during the 28th the wind increased in force until it attained a maximum velocity of sixty miles per hour, and from 12.30 to 4.30 p. m. it blew steadily at the rate of forty miles per hour; after 4.38 p. m. the wind rapidly diminished. This storm is rated as among the most severe for many years; little damage, however, was done in this city.

Portland, Me.: high winds, reaching a maximum velocity of fifty-one miles per hour and accompanied by rain and snow, prevailed during the 28th. The storm was of unusual severity, causing much damage on both land and water in this vicinity.

Keeler, Cal.: a storm, during which a maximum velocity of forty miles per hour from the south was recorded, occurred on the 29th. The heavy snowfall north of this city interrupted telegraphic communication and caused the delay of trains.

Frisco, Utah: on the 29th a maximum wind-velocity of sixty-five miles per hour was recorded, and during the greater part of the day a southwesterly wind blew at the rate of from forty to fifty-eight miles per hour.

INLAND NAVIGATION.

ICE IN RIVERS AND HARBORS.

Hudson River.—Albany, N. Y.: floating ice on 1st, 2d, and from 17th to 22d; the river froze over on 23d, closing navigation.

The following table, showing dates of closing of navigation at this point for each season since 1867, is from the "Albany Evening Journal" of the 21st:

Year.	Navigation closed.	Year.	Navigation closed.
1867	December 8	1877	December 31
1868	December 5	1878	December 20
1869	December 9	1879	December 20
1870	November 17	1880	November 25
1871	November 29	1881	*
1872	December 9	1882	December 4
1873	November 22	1883	December 15
1874	December 12	1884	December 19
1875	December 29	1885	December 13
1876	December 2	1886	December 3

*Boats ran this winter until January 2.

The Albany "Evening Post" of the 20th states:

Only four times during the past fifty years has the Hudson River been open for uninterrupted navigation at this date. The Troy boats are still running, making regular trips to Albany and Troy. The Albany boats have stopped.

Delaware, Lehigh, and Schuylkill rivers.—Philadelphia, Pa.: navigation on the Lehigh and Schuylkill was closed on the 28th; floating ice in the Delaware on the 29th and 30th.

Lake Ontario.—Oswego, N. Y.: the steam barges "Resolute" and "Reliance" left port on the morning of the 16th, the last departures of the season.

Niagara River.—Buffalo, N. Y.: navigation closed on the 14th; the river froze on the 29th.

Presque Isle Bay.—Erie, Pa.: the bay froze over for the first time this season on the 23d.

Lake Erie.—Cleveland, Ohio: navigation closed on 15th.

Sandusky River.—Sandusky, Ohio: navigation closed on the 20th; the river froze over on the 22d.

Maumee River.—Toledo, Ohio: the last boat of the season left port on the 11th; the river froze over on the 22d.

Grand River.—Grand Haven, Mich.: the river opened on the 1st, and partially froze over again on the 29th.

Saint Clair River.—Port Huron, Mich.: navigation closed on the 10th; the river froze over on the 24th.

Thunder Bay River.—Alpena, Mich.: the river froze over and navigation closed on the 23d.

Mackinaw Strait.—Mackinaw City, Mich.: the ice broke up in the strait and moved into Lake Michigan on the 23d.

Lake Michigan.—Chicago, Ill.: navigation closed on 13th.

Little Bay de Noquet.—Escanaba, Mich.: navigation closed on the 15th; the bay froze over on the 30th.

Missouri River.—Omaha, Nebr.: the river froze on the 5th, 11th, 21st, and 28th, and opened 6th, 12th, and 23d.

Leavenworth, Kans.: the river froze on the 21st, and on the 27th loaded wagons, etc., crossed on the ice.

Mississippi River.—La Crosse, Wis.: the river was frozen throughout the month.

Dubuque, Iowa: the river froze over on the 10th.

Keokuk, Iowa: floating ice on 5th; river froze over on 22d.

Cairo, Ill.: steamers arriving on the 21st from the south bound for Saint Louis were compelled to tie up in this harbor, owing to running ice and the low stage of water in the river;

navigation between this point and Saint Louis was practically suspended after this date. There was floating ice in the river on the 27th, 28th, and 30th.

Ohio River.—Cairo, Ill.: reports from Metropolis, Ill., state that the heavy floating ice interrupted navigation on the 29th; on this date the packet running between Cairo and Paducah, Ky., was compelled to discontinue trips.

Louisville, Ky.: the river was covered with thin ice on the morning of the 29th, on which date navigation was suspended for all boats except the larger steamers.

Laconia, Harrison Co., Ind.: navigation was suspended on the 30th on account of low water and floating ice in the river.

Allegheny and Monongahela rivers.—Pittsburg, Pa.: floating ice in both rivers from the 23d to the 26th and 28th, and in the Monongahela on the 30th and 31st; the Allegheny froze over on the 31st.

HIGH TIDES.

Coney Island, N. Y.: this island was swept by a northeast gale on the 28th, and the hotels and other property near the beach were badly damaged by the high tide. The beach was strewn with large quantities of timber and débris.

Long Beach, N. J.: the strong southeasterly gale on the 28th caused a very high tide which damaged property to a great extent.

High tides also occurred as follows:

Duke, Fla., 1st.; Chicamicomico, N. C., 1st to 3d; Eastport, Me., 16th; Wilmington, N. C., 17th; Atlantic City, N. J., 18th.

LOW TIDE.

Staten Island, N. Y.: an unusually low tide occurred on the 29th. "Split Rock," in the bay of Tompkinsville, L. I., which had not been seen for several years, was exposed to view.

STAGE OF WATER IN RIVERS AND HARBORS.

In the following table are shown the danger-points at the various stations and the highest and lowest depths for December, with the dates of occurrence, and the monthly ranges:

Heights of rivers above low-water mark, December, 1887 (in feet and tenths).

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
Red River:						
Shreveport, La	29.9	24, 25	21.6	1	8.0	13.6
Arkansas River:						
Fort Smith, Ark	22.0	4	8.8	30	1.1	7.7
Little Rock, Ark	23.0	7	10.1	1	1.4	8.7
Missouri River:						
Omaha, Nebr	18.0	24, 25, 26	6.1	12, 13	2.1	4.0
Leavenw'rth, Kans*	20.0	5	4.1	15, 16	3.2	0.9
Mississippi River:						
Saint Paul, Minn†	14.5	.....	.....	.....	.....	.....
La Crosse, Wis†	24.0	.....	.....	.....	.....	.....
Dubuque, Iowa	16.0	5, 6, 7	3.2	2	1.8	1.4
Keokuk, Iowa	14.0	21	1.7	3, 6	0.0	1.7
Saint Louis, Mo	32.0	9	7.5	26, 27	0.8	6.7
Cairo, Ill	40.0	12, 13	8.0	31	2.0	6.0
Memphis, Tenn	34.0	14, 15, 16	6.0	1, 2, 31	2.6	3.4
Vicksburg, Miss	41.0	20	5.0	2, 3	‡—3.5	8.5
New Orleans, La	13.0	23	2.8	1, 30	1.0	1.2
Ohio River:						
Pittsburg, Pa	22.0	7	6.9	30	3.8	3.1
Cincinnati, Ohio	50.0	17	7.5	2, 3	4.3	3.2
Louisville, Ky	25.0	20	4.4	2, 3	3.2	1.2
Cumberland River:						
Nashville, Tenn	40.0	27, 28	3.6	1, 2, 3	0.8	2.8
Tennessee River:						
Knoxville, Tenn	.....	29	4.5	4	1.8	2.7
Chattanooga, Tenn	33.0	30	5.5	2-6	1.6	3.9
Monongahela River:						
Pittsburg, Pa	29.0	7	6.9	30	3.8	3.1
Savannah River:						
Augusta, Ga	32.0	25	15.1	2-5	6.0	9.1
Sacramento River:						
Red Bluff, Cal	.....	29, 30	1.9	21-27	0.6	1.3
Sacramento, Cal	.....	30	10.8	24-26	7.5	3.3
Willamette River:						
Portland, Oregon	.....	9	10.6	24	1.6	9.0

* Frozen after 20th. † River frozen entire month. ‡ Below bench-mark.

Nashville, Tenn.: the first steamer since the suspension of navigation on account of low water, came up the Cumberland River from the Ohio on the 10th, the depth of water shown by the Nashville gauge being two and eight-tenths feet on that date. Navigation on the lower Cumberland was resumed on the 26th, and on the upper Cumberland on the 29th.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Auroras were observed during the month as follows: 6th, Cornish and Kent's Hill, Me.; North Truro, Mass.; Manitowoc, Wis. 7th and 8th, Manitowoc, Wis. 12th, Fort Totten, Fort Buford, and Webster, Dak.; Cornish, Me.; Cambridge, Mass.; Moorhead and Saint Vincent, Minn.; Poplar River, Mont. 13th, Webster, Dak.; Cornish, Eastport, and Kent's Hill, Me.; Poplar River, Mont.; Nashua, N. H.; Block Island, R. I. 14th, Egg Harbor City, N. J.; Manitowoc, Wis. 15th, Fort Buford, Dak. 16th, Bismarck, Dak.; Cornish and Kent's Hill, Me.; Moorhead and Saint Vincent, Minn.; Fort Custer and Poplar River, Mont.; Northfield, Vt. 17th, Fort Buford, Dak.; Cresco, Iowa; Duluth, Minn.; Poplar River, Mont.; Nashua, N. H. 18th, Saint Vincent, Minn. 20th, Wakefield, Kans. 21st, Webster, Dak.; Cornish, Eastport, and Kent's Hill, Me.; Blue Hill Observatory, Cambridge, and Fall River, Mass.; Moorhead and Saint Vincent, Minn.; Nashua, N. H.; Block Island, R. I.; Northfield, Vt. 22d, Blue Hill Observatory, Mass. 29th, Des Moines, Iowa.

THUNDER-STORMS.

Thunder-storms occurred as follows: Dodge City, Kans., 1st; Palestine, Tex., 3d; and Salt Lake City, Utah, 30th.

ELECTRICAL PHENOMENA.

Keeler, Cal.: on the evening of the 1st, during a light rain storm, and after the rain had ceased, the atmosphere was charged with electricity to an unusual degree, as was shown by the working of telegraph instruments. The office stove emitted electric sparks one-eighth of an inch in length.

Fort Sully, Dak.: on the 3d the telegraph wires were highly charged with atmospheric electricity; electric sparks one inch long were observed about the "cut-out" at 10 p. m.

Cheyenne, Wyo.: the presence of atmospheric electricity was very marked on the 12th; sparks one-eighth of an inch in length were produced by touching the steam heater, and all metallic surfaces or points when touched gave shocks which were quite perceptible.

MISCELLANEOUS PHENOMENA.

METEORS.

Dale Enterprise, Rockingham Co., Va.: a brilliant meteor was observed on the 11th, moving west; this vicinity was lighted up for several seconds as if by a prolonged flash of lightning.

Meteors were also observed as follows:

3d, Cleburne, Tex. 4th, Clayton, N. J. 5th, Little Rock, Ark.; Biloxi, Miss.; Fort Stanton, N. Mex. 6th, Clayton and Egg Harbor City, N. J. 7th, Wilson, Kans.; Woodstock, Md.; Kalamazoo, Mich. 8th, Fort Buford, Dak. 9th, Savannah, Ga. 10th, Stateburg, S. C. 11th, Wilson and Yates Center, Kans.; East Portland, Oregon; Quakertown, Pa.; Stateburg, S. C.; University of Virginia, Va. 12th, Archer and Cedar Keys, Fla.; Lebo and Wilson, Kans.; Beverly, N. J.; Charlotte,

N. C.; Andersonville, S. C.; University of Virginia, Va. 13th, Quakertown, Pa. 14th, Vashon, Wash. 15th, Marquette, Nebr. 17th and 18th, Fort Sully, Dak. 19th, Nashua, N. H. 21st, Boisé City, Idaho; Nashua, N. H.; Clayton, N. J. 23d, Fort Stanton, N. Mex.; Vashon, Wash. 24th, Andersonville, S. C.; Cairo, Ill. 25th, Dover, N. J.; Vashon, Wash., 26th, Yaquima L. H., Oregon. 27th, Dover, N. J. 28th, Beverly, N. J.

MIGRATION OF BIRDS.

Geese flying southward.—Linkville, Oregon, 2d, 3d; Red Bluff, Cal, 2d, 5th, 29th; Boston, Mass., 9th; Omaha, Nebr., 11th; Fort Madison, Iowa, 13th, 16th; Fort Sill, Ind. T., 14th; Fort Smith, Ark., and Keokuk, Iowa, 19th; De Soto, Nebr., 27th.

Geese flying westward.—San Antonio, Tex., 10th.

Swans flying eastward.—Nicolaus, Cal., 25th.

Ducks flying southward.—Corpus Christi, 20th; Savannah, Ga., 28th.

MIRAGE.

Fort Maginnis, Mont.: at 1.30 p. m. on the 6th buttes, woods, and basins situated about sixty miles southwest of station were plainly seen and recognized; the Yellowstone River, about fifty miles distant, was clearly defined, and its course could be traced for miles; this mirage was considered the most unusual that has been seen here for years.

Mirages were also observed at Saint Vincent, Minn., on the 11th, and at Marquette, Nebr., on the 6th, 9th, 10th, 21st.

PRAIRIE FIRES.

Fort Sill, Ind. T.: prairie fires were observed to the north and east of station on the 3d.

SAND STORMS.

Yuma, Ariz.: a violent sand storm began about noon on the 13th and continued until the following day; a maximum wind-velocity of forty miles per hour was recorded at 10.30 p. m.

Sand storms also occurred as follows: Yuma, Ariz., 2d, 11th, 29th; Fort Mojave, Ariz., 12th, 13th, 21st, 28th; Fort Grant, Ariz., 21st.

SUN SPOTS.

Mr. H. D. Gowey, North Lewisburg, Champaign Co., Ohio, observed sun spots as follows: 5th, 6th, 13th, 14th, 16th, 21st, 23d, 25th, 26th.

VERIFICATIONS.

INDICATIONS FOR 33 HOURS IN ADVANCE.

The percentages of verifications of the tri-daily indications for December, 1887, as determined from comparison of succeeding telegraphic reports are given in the table below:

The predictions for all districts east of the Rocky Mountains for December, 1887, were made by 1st Lieutenant Robert Craig, 4th Artillery, U. S. Army, Acting Signal Officer and Assistant, except those for Minnesota and eastern Dakota, which were made at Saint Paul, Minn., by 1st Lieutenant Thomas M. Woodruff, 5th Infantry, U. S. Army, Acting Signal Officer, and those for the Pacific coast districts were made at San Francisco, Cal., by 2d Lieutenant J. E. Maxfield, Signal Corps; the verifications for all districts were determined by Junior Prof. H. A. Hazen.

Percentages of indications verified, December, 1887.

States.		States.	
Maine	76.35	Kentucky	81.87
New Hampshire	74.30	Ohio	76.32
Vermont	72.45	West Virginia	75.97
Massachusetts	76.28	Indiana	76.90
Rhode Island	77.02	Illinois	79.71
Connecticut	78.42	Lower Michigan	78.11
Eastern New York	71.35	Upper Michigan	78.81
Western New York	73.45	Wisconsin	77.71
Eastern Pennsylvania	73.97	Minnesota*	75.40
Western Pennsylvania	77.10	Iowa	80.45
New Jersey	73.52	Kansas	77.48
Delaware	74.45	Nebraska	73.12
Maryland	69.48	Missouri	74.66
District of Columbia	78.03	Colorado	75.32
Virginia	74.13	Eastern Dakota.*	70.45
North Carolina	77.29	Southern California*	86.65
South Carolina	73.13	Northern California*	74.55
Georgia	74.10	Oregon*	70.57
Eastern Florida	70.83	Washington Territory*	73.37
Western Florida	71.71	*By elements:*	
Alabama	77.77	Weather	75.46
Mississippi	77.16	Wind	79.25
Louisiana	70.39	Temperature	74.11
Eastern Texas	69.81		
Arkansas	72.81	General average	75.30
Tennessee	76.19		

*In determining the general average percentage and the percentages for the different elements, Minnesota, eastern Dakota, and Pacific coast states have not been included.

CAUTIONARY SIGNALS.

Of the total number of cautionary and storm signals ordered during December, 1887, it was practicable to determine the justification or failure of sixty-nine; justified, forty-nine, or 71.02 per cent. Of the above, thirty-five were ordered for cautionary signals; number justified, twenty-six, or 74.29 per cent. Thirty-four storm signals were ordered; justified, twenty-three, or 67.65 per cent. Total number of direction signals ordered, eighty-three; justified, seventy-eight, or 93.98 per cent. Number of signals ordered for easterly winds, forty; justified, thirty-six, or 90.00 per cent. Number of signals ordered for westerly winds, forty-three; justified, forty-two, or 97.67 per cent. Number of storms without signals, eight. Number of signals ordered late, *i. e.*, after the justifying velocity had begun, seven, or 10.14 per cent.

COLD-WAVE SIGNALS.

Total number of cold-wave signals ordered, three hundred and sixteen; justified, two hundred and forty-seven, or 78.16 per cent. Sixty-three cold-wave signals were ordered during the month by the Signal Service Officer at Saint Paul, Minn., of which, fifty-three, or 84.13 per cent., were justified.

LOCAL VERIFICATIONS.

The following is from the report of the "Michigan State Weather Service" for December, 1887:

Weather and temperature signals are now displayed in one hundred and forty-two towns in the state, and on the baggage-cars of twenty-six trains on eight principal railroads of the state.

The percentage of verification of weather signals for December is as follows (the verification is taken from reports of displaymen furnished this office monthly): temperature, 81.6 per cent.; weather, 83.9 per cent.; temperature and weather, 82.8 per cent.

The percentage of verification of weather predictions for December on the D., G. H., and M. R'y., is 85.0 for weather and 75.7 for temperature; on the C. & G. T. R'y., weather, 83.3, and temperature, 79.2; P. H. & N. W. R'y., weather, 82.0, and temperature, 83.2; M. C. R'y, for weather, 85.9, and for temperature, 92.8; G. R. & I. R'y, weather, 83.0, and temperature, 81.3; C. & W. M. R'y, weather, 85.8, and temperature, 84.7; P. O. & P. A. R'y, weather, 79.7, and temperature, 83.7.

Cold-wave signals were ordered by the Chief Signal Officer on the 4th at 11 a. m.; 10th, at 7 a. m., and continued until the 12th; on the 19th and continued until 7 a. m. 22d, and on the 27th and continued until 7 a. m. of the 29th. The signal of the 4th was verified by a fall of 30°; that of the 10th by 15°. The order of the 19th was not justified until the morning of the 22d, when a fall of 35° was recorded; a fall of 25° followed the order of the 27th.

The following is from the December, 1887, report of the "South Carolina Weather Service:"

The percentage of verification of the weather and temperature predictions for the whole state was: for weather, 86.4; for temperature, 91.9.

The following is from the "Tennessee State Board of Health Bulletin" for December, 1887:

There were four cold-wave warnings received during the month, viz.: 4th-5th, 11th-13th, 19th-22d, and 27th-29th; all fully verified.

The percentage of verification of weather and temperature predictions, fur-

nished daily from the Signal Office at Washington to the various stations in the state during the month, was for the state: weather, 84.4 per cent.; and temperature, 85.6 per cent.

The following is from the report of the "Nebraska Weather Service:"

The daily predictions of the Chief Signal Officer have been distributed by this service to upwards of fifty stations, partly by mail and partly by telegraph, and arrangements are being made to increase the list of such stations. The value of this service is evinced by the increasing number of places desiring the predictions. The percentage of correct predictions for December is 87; 86 for weather, and 88 for temperature.

STATE WEATHER SERVICES.

The following extracts are republished from reports for December, 1887, of the directors of the various state weather services:

The "Alabama Weather Service," P. H. Mell, jr., of the Agricultural and Mechanical College, Auburn, director:

Very few days in the month were clear and pleasant. The period was generally cloudy, with frequent occurrence of rains, making December the wettest month of the year. The excess of precipitation over the normal was 4.99 inches. This unusual rainfall was rendered necessary to fill up the deficiencies in the first and second quarters of the year. Even with this heavy fall, however, the annual precipitation is below the average 10.53 inches. The temperature was 3°.7 below the normal. There were four cold waves predicted for the month, viz., on the 5th, 19th, 21st, and 28th. The one predicted for the 19th failed to make its appearance. The others came as indicated, and although the reduction of temperature was unpleasant, still the waves were not severe for the season of the year.

Summary.

Atmospheric pressure (in inches).—Monthly mean, 30.15; maximum observed, 30.74, at Auburn, on the 1st; minimum observed, 29.48, at Montgomery, on the 24th; range for state, 1.26.

Temperature (in degrees Fahr.).—Monthly mean, 45°.9; highest monthly mean, 58°.6, at Newton; lowest monthly mean, 33°.6, at Chattanooga; maximum, 73°, at Greenville, on 6th; minimum, 10°, at Gadsden, on the 29th; range for state, 63°; greatest local monthly range, 51°, at Greenville; least local monthly range, 36°, at Newton.

Precipitation, including melted snow (in inches).—Average for the state, 9.84; greatest, 15.95, at Mount Willing; least, 5.46, at Chattanooga, Tenn.

Winds.—Prevailing direction, southeast.

The "Monthly Review of the Illinois Weather Service," Col. Charles F. Mills, Springfield, director:

The general meteorological features of the month were not very unusual. The changes in pressure, with two exceptions, were not great, but were quite numerous. The daily isobars, or lines of equal pressure, were very irregular, and only few symmetrical "highs" or "lows" were formed. The "highs" of the 21st, 22d, 28th, and 29th, and the "low" of the 31st were the most notable; especially the last two which were each the extreme of its class during the month. From the 29th, when the barometer at Springfield was 30.76, to the 31st, when it was 29.44, the fall was 1.32 inches, a very unusual one in such a brief period of time. The month opened with a very high barometer and ended with a very low one.

The mean temperature of the month for the state was 1° above the mean of ten years, the excess being greater in the northern division, where it was 1°.9, and least in the southern, where it was only 0°.4.

The precipitation for the month was also above the average of ten years, 1.08 inches for the state, 1.63 inches for the northern, and 0.04 of an inch for the southern division.

The "Indiana Weather Service," Prof. H. A. Huston, of Purdue University, Lafayette, director:

The barometric pressure during the month was slightly below the normal for the state, and subject to rapid and great oscillations, especially so on the 3d, 11th, 17th, 20th, 27th, and 30th. Exceedingly high readings were noted on the 1st and 30th, while the lowest occurred on the 31st.

The temperature was nearly normal; a uniformly cool temperature prevailed, only interrupted by a warm period on the 3d and 4th; the lowest temperatures prevailed on the 22d, 29th, and 30th; the temperatures during the latter dates reached below zero.

The precipitation was slightly in excess; heavy rains occurred on the 3d and 4th, and quite a heavy and steady rainfall on the 31st was preceded during the afternoon and evening of the 30th by heavy snows at many stations.

Summary.

Atmospheric pressure (in inches).—Monthly mean, 30.136: maximum observed, 30.800, at Lafayette, on the 29th; minimum, 29.520, at Worthington, on the 31st; range for state, 1.280; greatest local range, 1.264, at Mount Vernon; least local range, 1.050, at Vevay.

Temperature (in degrees Fahr.).—Monthly mean, 30.3; highest monthly mean, 36.1, at Marengo; lowest monthly mean, 26.8, at La Grange; maximum, 60.0, at Rockville, on the 4th; minimum, —9.0, at Lafayette, on the 29th; range for state, 57.1; greatest local monthly range, 64.0, at Richmond, Lafayette, and Logansport; least local monthly range, 49.0, at Fort Wayne.

Precipitation, including melted snow (in inches).—Average for the state, 3.76; greatest, 7.23, at Marengo; least, 2.30, at Crawfordsville.

Wind.—Prevailing direction, southwest.

The "Louisiana State Weather Service," in charge of R. E. Kerkam, Sergeant, Signal Corps, at New Orleans:

The mean temperature of the month for the state, 49°.6, was 1°.9 below the December normal for the past seventeen years, in which period the lowest December mean, 42°.6, occurred in 1876, and the highest, 57°.9, in 1875. There were but few Decembers in the above-named period in which the mean temperature was below that of the past month. The mean temperature of the northern section was 46°.8, and of the southern section, 51°.8 The maximum temperature, 77°, was reported from Donaldsonville and New Iberia on the 4th, and from New Orleans on the 7th. The minimum temperature, 20°, was reported from Shreveport, on the 21st. The mean daily range of temperature for the state was 13.9. The greatest daily range, 32°, was reported from Delta on the 6th, and the least daily range, 2°, from Monroe on the 16th.

The average precipitation for the state for the past month, 7.34 inches, was 2.04 inches above the December average of the past seventeen years, in which period it was exceeded but twice—1872, 7.56 inches, and 1884, 13.31 inches. The average for the northern section, 7.16 inches, was 1.54 inches above, and for the southern section, 7.51 inches, was 2.45 inches above the December normal. The average number of days on which measurable precipitation fell was fourteen, consequently the distribution was regular throughout the month, the heaviest general rains occurring on the 23d-24th.

The prevailing direction of the wind was from the north in the northern section, and from the northeast in the southern section. The average total movement of wind for the state was 5,354 miles, making an average hourly velocity of 7.2 miles. The highest velocities occurred on the 31st at all the stations reporting—the maximum reported being 36 miles per hour, from the west, at Vicksburg.

A mean relative humidity of 83 per cent. for the month is deduced. This is over 11 per cent. above the December normal.

Summary.

Temperature (in degrees Fahrenheit).—Monthly mean, 49.6; highest monthly mean, 52.9, at New Orleans; lowest monthly mean, 45.4, at Shreveport; maximum, 77, at Donaldsonville and New Iberia on the 4th, and at New Orleans, on the 7th; minimum, 20, at Shreveport, on the 21st; range for state, 57; greatest local monthly range, 54, at Shreveport; least local monthly range, 40.4, at Grand Coteau; greatest daily range, 32, at Delta, on the 6th; least daily range, 2, at Monroe, on the 16th.

Precipitation, including melted snow, (in inches).—Average for the state, 7.34; greatest, 8.26, at New Iberia; least, 6.56, at Liberty Hill.

Wind.—Prevailing direction, northeast.

The "Michigan Weather Service," N. B. Conger, Sergeant, Signal Corps, Lansing, director:

The meteorological features of the state are based upon reports received from seventy-eight voluntary, and eight United States Signal Service observers.

Atmospheric pressure (in inches and hundredths).—The mean monthly pressure is 30.06. The mean pressure for each section is, this month, nearly the same, the greatest difference occurring in the southern section. The area of high pressure, which was central over Michigan on the a. m. of the 1st passed rapidly eastward, and was followed by a low area which was central over the state on the evening of the 3d, moving eastward. This low area was accompanied by heavy rain throughout the state during the afternoon and evening of the 3d and changed to snow on the 4th. The low area of the 17th first appeared on the a. m. of the 16th in Montana and Northwest Territory and moved eastward, and was central over northern Michigan and Lake Superior on the morning of the 17th, and during the day the pressure slowly decreased, and rose steadily until the 22d. A low area appeared on the 31st which developed rapidly, and was accompanied by snow, turning to rain, on the evening of the 31st. A high area passed on the 24th and 28th, accompanied by decidedly cold weather.

Temperature (in degrees Fahr.).—The mean monthly temperature, 27.4, is 1.0 above the normal of thirteen years. The upper peninsula is 0.2 below the normal; the northern section 1.6 above the normal; the central section 1.0, and the southern section 0.4 above the normal. The highest temperature for the month, 66, was recorded at Coldwater, in the southern section, on the 4th, and the lowest temperature, —13.5, at Mottville, in the southern, on the 30th. The mean range of temperature is 50.7. The highest mean daily temperature, 50.0, was recorded at Sand Beach on the 4th, and the lowest mean daily temperature, 3°.0, was recorded at Calumet on the 28th. The warmest day was the 4th, when the mean temperature for the state was 40.0, and the coldest days were the 29th and 30th, the mean temperature being 12.0. Comparing this with the mean daily temperatures for December since 1875, it is

found that the highest mean daily temperature, 59.0, occurred on December 31, 1875, and the lowest mean daily temperature was —8.0, on December 29, 1880. The highest mean monthly temperature was, 37.2, in 1877, and the lowest, 17°.2, in 1876. Four cold waves passed over the state: on the 5th, 12th, 22d, and 28th, causing a fall in temperature of from 15.0 to 35.0 in each case, except the 10th, when the fall was but 15.0.

Precipitation (in inches and hundredths).—The average monthly precipitation for the state, 3.14, is 0.44 above the normal. The departures from the normal in the different sections are as follows: upper peninsula 0.27 above; northern section 0.32; central section 0.52, and the southern section 0.54 above the normal precipitation for thirteen years. The maximum monthly precipitation for December since 1875 was 4.85, in 1884, and the minimum monthly precipitation was 1.70, in 1880. The total rainfall for the year 1887 is 30.82, or about 5.2 below the normal. The average number of days on which .01, or more, of precipitation occurred was 13.1 for the state, 23.7 for the upper peninsula, 14.6 for the northern section, 12.3 for the central section, and 11.4 for the southern section. Greatest number of days of precipitation at any station was, 24, at Marquette and Gaylord; least, 4, at Romeo. The number of days on which rain or snow was recorded in the several sections will be found in the summary, for the state.

Wind.—The prevailing direction of wind for the month was southwest. The average total movement of the wind, in miles, was 7,916. The greatest movement, 10,969 miles, occurred at Mackinaw City, and the least movement, 6,103 miles, at Cassopolis. The maximum velocity of wind, 60 miles per hour, direction southeast, on the 31st, at Mackinaw City. High winds were recorded on the 2d, 4th, 9th, 21st, 28th, and 31st.

The "Mississippi Weather Service," Prof. R. B. Fulton, of the University of Mississippi, Oxford, director:

The mean temperature for the state for the past month was 46°, which is 2° in excess of the mean for December, 1886. The state was visited by four cold waves during the month, all of which were predicted by the United States Signal Service and were fully verified.

The average precipitation was 8.06 inches, which is 5.80 inches in excess of the average for this month last year. Average number of days on which rain fell, 13. The total amount of snowfall for the month occurred as follows: University, 0.7 inch; Palo Alto, 2.00 inches; Hermanville, 3.00 inches; West Point, 1.50 inches; Starkville, 4.50 inches; Jackson, 1.00 inch. Heavy rainfalls, one inch, or more, occurred as follows: 3.75 inches, at Jackson, on the 7th; 2.75 inches, at A. and M. College, on the 31st; 2.00 inches, at West Point, on the 31st; 2.70 inches at Hermanville, on the 7th; 2.04 inches, at Palo Alto, on the 31st; 2.18 inches, at Mobile, on the 8th; 1.59 inches, at Memphis, on the 31st; 1.39 inches, at Vicksburg, on the 31st; 2.65 inches, at Biloxi, on the 24th; 2.00 inches, at Batesville, on the 8th; 1.73 inches at Artonish Plantation, on the 31st.

Summary.

Atmospheric pressure (in inches).—Monthly mean, 30.02; maximum observed, 30.67, at Memphis, on the 29th; minimum observed, 29.31, at Vicksburg, on the 31st; range for state, 1.36; greatest local monthly range, 1.18, at Memphis; least local monthly range, 0.90, at Biloxi.

Temperature (in degrees Fahr.).—Monthly mean, 46; highest monthly mean, 51, at Mobile and Biloxi; lowest monthly mean, 41, at Memphis; maximum, 80, at Artonish Plantation, on the 4th; minimum, 14, at Memphis, on the 21st; range for state, 66; greatest local monthly range, 55, at Artonish Plantation; least local monthly range, 39, at Biloxi; greatest daily range, 35, at West Point, on the 20th; least daily range, 0, on the 21st, at Artonish Plantation.

Precipitation, including melted snow (in inches).—Average for the state, 8.06; greatest, 11.17, at Starkville; least, 5.80, at Memphis.

The "Missouri Weather Service," Prof. Francis E. Nipher, of Washington University, Saint Louis, director:

The average temperature for December throughout the state was 29°.1. The highest reported was 67°, at Pro Tem, and the lowest, 18° below zero, at Princeton, making a total range of 85° for the state. The average of minimum temperatures was 7°.2 below zero, and the average of maximum temperatures, 58°.6, making an average range of 65°.8. From the 27th to the 29th a cold wave extended over the state, reducing the temperature at all stations to a minimum below zero; another cold wave extended over the state from the 20th to the 22d, but it was not quite as severe as the other.

The average rainfall for December was 2.86 inches. It was fairly distributed over the state, the greatest amount having fallen in the southeastern portion and the least in the northwestern portion of the state. The greatest amount of rainfall reported was 4.12 inches, at Cairo, Ill., and the least, 1.60 inches, at Savannah.

At the central station (Saint Louis) the mean temperature was 32°.1, which was about the normal for December. The highest temperature was 57°.2, on the 3d, and the lowest, 2°.4 below zero, on the 28th. The total precipitation was 3.24 inches.

The "Nebraska Weather Service," Prof. Goodwin D. Swezey, of Doane College, Crete, director:

The month of December, 1887, has not been in any respect a marked month. The precipitation, which has been wholly in the form of snow, has been not far from normal. Over the greater part of the state it has been less than an inch, although the western end of the state and a strip bordering the Missouri River have had upwards of an inch, reaching two inches in the extreme northeastern corner of the state. The average snowfall over southeastern Nebraska has been 5.7 inches, and the number of days on which it fell, six.

The only respect in which the temperature of the month has been unusual is the minimum temperature of the month, 28° below zero. During the past ten years it has only once fallen to —26° and once to —18°. The mean temperature has been 21°.6, which is about 1°.5 below the normal.

The "New England Meteorological Society," Prof. Wm. H. Niles, of the Institute of Technology, Boston, Massachusetts, president:

Reports for the month were received from one hundred and forty-seven observers.

The mean temperature for the month has been above the normal at nearly all stations, ranging from 3°.5 above the mean of twenty years at Concord, N. H., to 0°.2 below the mean of twelve years at Waterbury.

The precipitation has been in excess at all stations, except Boston, Amherst, and New Haven.

Summary.

Atmospheric pressure (in inches).—Monthly mean, 30.07 (twenty-three stations); maximum observed, 31.02, at Northfield and Newburyport, on the 1st; minimum observed, 28.86, at Block Island and Providence, on the 18th; range for New England, 2.16; greatest local monthly range, 2.03, at Providence; least local monthly range, 1.74, at Northfield.

Temperature (in degrees Fahr.).—Monthly mean, 28.4 (one hundred and six stations); highest monthly mean, 37.3, at Block Island; lowest monthly mean, 19.8, at Berlin Mills; maximum, 63, at Westborough, on the 11th; minimum, —30, at Woodstock, Vt., on the 30th; range for New England, 93; greatest local monthly range, 79, at Strafford; least local monthly range, 44, at Nantucket; greatest daily range, 50, at Lake Cochituate, on the 28th; least daily range, 1, at Lowell, on the 16th, and Randolph, on the 25th.

Precipitation, including melted snow (in inches).—Average for New England, 4.35 (one hundred and thirty-two stations); greatest, 6.50, at Shelton, least, 2.70, at Block Island.

Wind.—Prevailing direction, northwest (sixteen stations).

The "New Jersey Weather Service," Prof. George H. Cook, of the Agricultural College, New Brunswick, director:

Temperature (in degrees Fahr.).—Monthly mean, 33.7; highest monthly mean, 38.5, at Ocean City; lowest monthly mean, 30.3, at Hanover; maximum, 63.0, at Ocean City, on the 4th; minimum, 6.0, at Hanover, on the 1st; range for state, 57.0; greatest local monthly range, 53.0, at Hanover; least local monthly range, 41.5, at Atlantic City; greatest daily range, 35.0, at Hanover, on the 28th; least daily range, 2.0, at Newark, on the 15th. The mean temperature, 33.7, is 1.1 above the December normal.

Precipitation, including melted snow (in inches).—Average for the state, 5.29; greatest, 7.32, at Lambertville; least, 3.64, at Union. The average precipitation, 5.29, is 2.61 above the December average for the state.

Wind.—Prevailing direction, northwest.

The "North Carolina Weather Service," Dr. Herbert Battle, of Raleigh, director:

Summary.

Temperature (in degrees Fahr.).—Monthly mean, 42.6; normal, 41.6; departures from the normal, +1; highest, 68.0, at Chapel Hill, N. C., on the 4th, lowest, 12.9, at Lynchburg, Va., on the 30th; highest on record, 78.0, in 1879; at Wilmington, N. C.; lowest on record, —5.0, at Knoxville, Tenn., and Lynchburg, Va., in 1880; range for the state, 55.1; mean daily range, 15.7.

Precipitation (in inches and hundredths).—Monthly average, 4.75; normal, 4.85; departure from the normal —0.10; greatest local daily rainfall, 3.10, at Hatteras, N. C., on the 10th; greatest monthly rainfall, 7.78, at Southport, N. C.; least monthly rainfall, 2.07, at Asheville, N. C.

Relative humidity.—Mean, 77.6 per cent.; normal, 73.6 per cent.; departure from the normal, +4.0.

Wind.—Prevailing direction, northeast.

The "Ohio Meteorological Bureau," Prof. B. F. Thomas, of the Ohio State University, Columbus, president:

Atmospheric pressure (in inches).—Monthly mean, 30.126; maximum, 30.906, at Canton and Hiram, on the 1st; minimum, 29.551, at Celina, on the 31st; range for state, 1.355; greatest local range, 0.691, at Wooster, on the 28th; least local range, 0.024, at Akron and Wooster, on the 24th.

Temperature (in degrees Fahr.).—Monthly mean, 31.3; highest monthly mean, 36.2, at Pomeroy; lowest monthly mean, 26.9, at Wauseon; maximum, 62.0, at Portsmouth, on the 4th, 5th, and 6th; minimum, —8.0, at Paulding, on the 30th; range for state, 70.0; greatest local monthly range, 64.0, at Paulding; least local monthly range, 46.0, at Oberlin; greatest daily range, 43.5, at Dayton, on the 28th; least daily range, 2.0, at Celina, on the 12th.

Precipitation, including melted snow (in inches).—Average for the state, 2.46; greatest, 4.83, at New Bremen; least, 1.11, at Oberlin.

Wind.—Prevailing direction, southwest.

"Oregon Weather Service," report prepared by B. S. Pague, Sergeant, Signal Corps:

Reports were received from twelve stations, covering the coast, the southern region, and the interior valleys, and also from The Dalles. The great "Inland Empire" (eastern Oregon) is not represented; the climate of this region being

entirely different from that of western Oregon. The prevailing characteristics of the climate of eastern Oregon are briefly these: extreme cold weather, with snow, in winter, the temperature recording as low as 20° below zero at places, and very warm and absolutely dry weather in summer.

In these reports, for the present, the climate of that portion of Oregon west of the Cascade Mountains only will be given. It is hoped that stations will soon be established in eastern Oregon, when the whole state will be represented.

The month was characterized by an excess of temperature and precipitation in the northern part of the state and along the coast, and by a deficiency of both in the southern part. The month opened with a well-marked storm off the mouth of the Columbia River. This storm was succeeded by a succession of light storms, giving almost constant rain until the 13th. From the 16th to the 23d, the weather was generally fair, broken by a light storm on the 24th, and by a severe storm on the 27th, which latter gave a copious rainfall and snow in the mountains.

Temperature (in degrees Fahr.).—The mean temperature for the state was 38.9; the maximum, 58, at Roseburg and Ashland; the minimum, 4, at Fort Klamath. The highest temperature occurred from the 1st to 13th, and the lowest from the 21st to 25th. Along the coast, in the Umpqua and Willamette valleys, the temperature was from 0.7 to 1.7 above the normal. In the extreme southern part of the state the temperature was from 2 to 5 below the normal. The last eleven days of the month were generally below the normal.

Precipitation (in inches).—The precipitation was from one to five inches above the normal along the coast and in the interior valleys, and about one inch below the normal in the southern part of the state. The greatest excess, 5.00 inches, occurred at Albany, and the greatest deficiency, 1.15 inches, at Ashland. For the season from July 1st, the precipitation is above the normal at Astoria and Albany, nearly normal at Roseburg, and below the normal in all the other districts; the greatest deficiency, 5.10 inches, being at Ashland.

Very heavy rains occurred in the northern part of the state on the 6th. Precipitation occurred on from ten to twenty-four days throughout the state.

The "Pennsylvania State Weather Service," report prepared under the direction of the Franklin Institute, Philadelphia, by Sergeant T. F. Townsend, Signal Corps:

The characteristics of the weather of December were similar to those of November in the general moderation of the changes of temperature and the absence of extremes. While the mean temperature of 31°.5 is very nearly that of the absolute mean, the general climate has been mild rather than severe. The equable temperature, and the absence of heavy snowfalls during the first and middle parts of the month, have been favorable for the continuance of building operations, plowing, and the usual out-door work performed at this season of the year. The month has been favorable to the growth of winter wheat, which is reported in excellent condition. The pasturage of the lower counties has been of value.

The coldest period of the month was from the 22d to the 31st, inclusive. The lowest temperatures reported were, Dyberry, —6°, on the 31st; Lancaster, —3° 8, 29th; Wysox, 0°.5, 31st; Phillipsburg, 0°.0, 1st; Scranton, 3°.5, 1st; Pittsburg, 7°.5, 29th; Philadelphia, 14°.5, 29th. The highest temperatures occurred on the 4th, 10th, and 11th, and ranged from 50° to 60°.

Most of the high barometric pressures were on the 1st, and the lowest on 17th and 18th. The latter was attended by general rains and snows, which were heavy east of the Alleghenies.

With the exception of the 1st, 6th, and 13th rain or snow fell in measurable quantities on every day of the month in some part of the state. The total precipitation has been very unevenly distributed. In many of the eastern counties there was an excess of 100 per cent., while in the western it ranged from normal to a deficit of from 30 to 50 per cent. The following are the greatest reported: West Chester, 6.81 inches; Pottstown, 6.50 inches; Quakertown, 6.05 inches; Blooming Grove, 5.80 inches; Philadelphia, 5.06 inches. The least are: Clarion, 1.49 inches; Oil City, 1.76 inches; Uniontown, 1.69 inches, and Meadville, 1.89 inches.

Several of the western counties report much inconvenience from the continued drought.

Snows occurred from the middle to the last of the month in variable quantities, amounting to a total of about two feet in some of the northern and eastern counties. Owing to its being closely followed by rains, the snow was soon melted, and did not cause much interference with, or interruption to, travel. In the wooded districts of the state the snow has not been sufficient to enable the lumbermen to transport their logs and timber to the streams.

The prevailing winds have been from the northwest and southwest, with an absence of severe gales. More than the usual number of cloudy days have been reported. The weather summary for the month shows the following: cloudy, 16 days; fair, 9 days; clear, 6 days.

The "South Carolina Weather Service," Hon. A. P. Butler, Com'r of Agriculture for South Carolina, Columbia, director:

Most prominent during the month were the cold waves. The cold-wave signal orders, with but one exception, were fully justified, and the criticism on this particular branch is very flattering to the service, the signals having been ordered far enough in advance to satisfy all.

The areas of low barometer, appearing at different times during the month, brought with them rain, the largest amount falling in the state on the 24th of the month. The greatest amount of precipitation fell in the southern counties, and the least in the middle counties.

Summary.

Temperature (in degrees Fahrenheit).—Monthly mean, 44.9; highest monthly mean, 51.1, at Charleston; lowest monthly mean, 40.1, at Kirkwood; maximum, 76, at Spartanburg, on the 3d; minimum, 18, at Cheraw and Brewer Mines, on the 30th; range for state, 58; greatest local monthly range, 57, at Spartanburg; least local monthly range, 30, at Marion; greatest daily range, 39, at Cedar Springs, on the 3d; least daily range, 0, on the 9th at Belfast.

Precipitation, including melted snow (in inches).—Average for state, 4.65; greatest, 7.91, at Charleston; least, 3.31, at Stateburg; average number of rainy days, 9.7.

Wind.—Prevailing directions, northeast and east.

The following is an extract from the report of the "Meteorological Department of the State (Tennessee) Board of Health," prepared under direction of J. D. Plunkett, M. D., President of the State Board of Health, by H. C. Bate, Signal Corps, Assistant, Nashville:

The special features for December were the heavy rainfall of the 31st and the absence of any electrical disturbance except on that day.

The mean temperature was 38°.6, about the normal for the past five years, the greatest during that period being 42°.9, in 1883, and the least, 34°.6, in 1886. The highest temperature was 65°, recorded on the 3d and 6th, and was, by several degrees, the lowest December maximum during the period above-named. The lowest temperature was zero, recorded on the 29th, and was 8° above the December minimum of 1886, 12° above the December minimum of 1883 and 1885, and 1° above the December minimum of 1884. The ranges of temperature were less than the normal.

The mean precipitation for the month was 5.05 inches, nearly one inch above the December mean of the past five years. Of this amount, the eastern division received an average of about four and a half inches; the middle division a little more than five inches, and the western division nearly five inches. The greatest local precipitation for the month was 8.70 inches, at Fostoria, and the least, 2.06 inches, at Waverly. The greatest amount in twenty-four consecutive hours was 3.88 inches, at Lawrenceburg, from 4 a. m. to 11 p. m. on the 31st. The day of the greatest rainfall was the 31st, when an average of 1.60 inches of rain fell throughout the state. Up to this date there was quite a deficiency in the rainfall for the month. The greater portion of this rain fell in the middle division. With the exception of those of the 7th, 9th, and 31st, the rains during the month were mostly light. The 1st, 12th, 18th, 21st, 22d, and 29th were reported without measurable rainfall.

Snows were reported on the 17th, 24th, 25th, 26th, 28th, and 30th, and were generally light, the greatest depth reported being 4.50 inches at Greenville and Andersonville. Very little fell in the middle and western divisions. The snowfall during the year was very small compared with the four preceding years.

NOTES AND EXTRACTS.

OCEAN FOG PREDICTIONS.

[By E. B. GARRIOTT, Sergeant, Signal Corps.]

It is interesting to note that the comments which have been made in the WEATHER REVIEW on the subject of ocean fog have been consistent with the facts deduced from special fog reports made by shipmasters during the past fourteen months. This system of reports was inaugurated to verify the theory that in the passage of low barometer areas over or near the Banks of Newfoundland, meteorological conditions favorable to the precipitation of fog atoms are developed, and the reports of each succeeding month have not only verified the correctness of this theory, but have also served to establish the fact, to which few, if any, exceptions have been noted, that the development of fog near Newfoundland attends the circulation of winds in the southern quadrants of low barometer areas. With a knowledge of this fact the practicability of forecasting the presence of fog over the Banks is limited only by the difficulties which may attend the forecasting of the passage of low barometer areas over or near that region. The extent to which these difficulties are surmountable can be readily determined by a study of the storms which first appear over the American continent or over the ocean west of the sixtieth meridian. Of the first-named class of storms it is known that those of marked energy commonly move eastward over the Gulf of Saint Lawrence or the Atlantic coast to the southward; in the case of storms of tropical or sub-tropical origin which advance along the course of the Gulf Stream, it has been found that their progress is usually indicated by telegraphic reports from coast stations. The storm-track charts also show that the normal paths of all storms which develop west of the sixtieth meridian traverse the region which embraces or immediately adjoins Newfoundland and the Grand Banks. It would therefore appear that of the preliminary knowledge necessary to the successful making of fog predictions there remains to be determined, through the experience and current work of the Signal Office, the storms which, appearing over the interior of the country, are likely to move eastward over the coast line, or, on being located off the lower coast, possess sufficient strength to

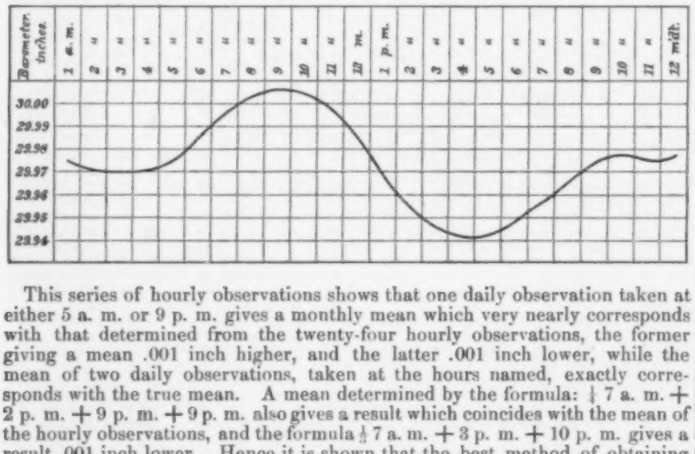
advance northeastward to the vicinity of Newfoundland. As these movements are calculated tri-daily, there are, apparently, no elements of theory or fact wanting to successfully forecast fog for the Banks of Newfoundland for periods of from four to five days.

MEAN HOURLY VARIATIONS OF ATMOSPHERIC PRESSURE.

Hourly observations of the barometer were taken at the office of the Chief Signal Officer in Washington City from May 1, 1887, until the close of the year. Means for the several hours for each month and for the entire period, determined from observations taken daily at the same hour, are given in the following table, together with monthly means computed from the twenty-four daily observations:

Hour of observation.	May.	June.	July.	August.	September.	October.	November.	December.	Means for period of 8 months.
1 a. m.	29.948	29.937	29.908	29.903	30.039	29.975	30.009	30.078	29 975
2 a. m.	29.944	29.933	29.900	29.898	30.030	29.974	30.010	30.079	29.971
3 a. m.	29.943	29.937	29.895	29.898	30.029	29.968	30.008	30.081	29.970
4 a. m.	29.947	29.939	29.895	29.899	30.033	29.968	30.006	30.077	29.970
5 a. m.	29.954	29.940	29.906	29.904	30.040	29.976	30.006	30.074	29.975
6 a. m.	29.966	29.954	29.912	29.914	30.051	29.980	30.017	30.078	29.984
7 a. m.	29.976	29.957	29.916	29.922	30.062	29.997	30.031	30.088	29.994
8 a. m.	29.981	29.964	29.922	29.930	30.061	30.012	30.046	30.094	30.001
9 a. m.	29.982	29.967	29.925	29.928	30.074	30.017	30.054	30.103	30.006
10 a. m.	29.979	29.966	29.926	29.928	30.072	30.012	30.053	30.105	30.005
11 a. m.	29.974	29.964	29.924	29.924	30.065	30.004	30.044	30.095	29.999
12 m.	29.963	29.958	29.915	29.913	30.054	29.987	30.022	30.074	29.986
1 p. m.	29.949	29.945	29.901	29.902	30.038	29.965	30.006	30.054	29.970
2 p. m.	29.936	29.934	29.885	29.889	30.020	29.951	29.993	30.043	29.956
3 p. m.	29.922	29.922	29.875	29.878	30.010	29.945	29.993	30.040	29.948
4 p. m.	29.916	29.911	29.864	29.871	30.002	29.941	29.991	30.041	29.942
5 p. m.	29.915	29.903	29.861	29.872	29.999	29.944	29.998	30.048	29.942
6 p. m.	29.915	29.906	29.866	29.872	30.004	29.953	30.012	30.056	29.948
7 p. m.	29.924	29.909	29.874	29.883	30.010	29.962	30.024	30.065	29.956
8 p. m.	29.931	29.920	29.880	29.898	30.024	29.968	30.030	30.066	29.965
9 p. m.	29.938	29.933	29.898	29.908	30.032	29.975	30.034	30.068	29.973
10 p. m.	29.944	29.940	29.903	29.911	30.034	29.979	30.038	30.068	29.977
11 p. m.	29.943	29.941	29.903	29.910	30.034	29.974	30.051	30.064	29.976
12 midnight	29.942	29.942	29.903	29.914	30.032	29.974	30.044	30.071	29.978
Monthly mean.	29.947	29.938	29.898	29.903	30.035	29.975	30.021	30.071	29.974
Difference between highest and lowest hourly means	.067	.063	.065	.059	.075	.076	.063	.065	.067

The diagram given below illustrates the mean hourly variations of pressure, the scale being such as to permit a close approximation of the actual figures on which it is based. It will be seen that the daily maximum occurs about 9 a. m. and the daily minimum from 4 to 5 p. m., while a second maximum, about .028 inch lower than that at 9 a. m., occurs from 10 p. m. to midnight, and a second minimum, .028 inch higher than at 4 to 5 p. m., occurs from 3 to 4 a. m.



This series of hourly observations shows that one daily observation taken at either 5 a. m. or 9 p. m. gives a monthly mean which very nearly corresponds with that determined from the twenty-four hourly observations, the former giving a mean .001 inch higher, and the latter .001 inch lower, while the mean of two daily observations, taken at the hours named, exactly corresponds with the true mean. A mean determined by the formula: ¼ 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. also gives a result which coincides with the mean of the hourly observations, and the formula ½ 7 a. m. + 3 p. m. + 10 p. m. gives a result .001 inch lower. Hence it is shown that the best method of obtaining a monthly mean from one observation daily is by taking the observation either at 5 a. m. or 9 p. m.; the best mean from two daily observations being either ½ 5 a. m. + 9 p. m., or ½ 8 a. m. + 6 p. m., the latter combination recommending itself as the more desirable on account of the convenient hours of observation; from three observations, ¼ 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. With respect to the method of obtaining means from two observations taken at hours of the same name, *i. e.*, 1 a. m., 1 p. m., etc., it is shown by this series of hourly observations that 7 a. m. and 7 p. m. give the best result, the mean of these two observations being within .001 inch (higher) of that of the twenty-four hourly observations. Means obtained by combinations of observations at two hours of the same name show that from 1 to 6 o'clock, a. m. and p. m., they are too low, while from 7 to 12 o'clock, a. m. and p. m., they are too high; the 4 a. m. and 4 p. m. combination gives the minimum, and the 10 a. m. and 10 p. m. the maximum, these means being .018 inch and .017 inch, respectively, below and above the mean of the twenty-four daily observations.

Tables showing monthly and annual mean temperatures (in degrees Fahr., and precipitation (in inches and hundredths) at New Ulm, Austin Co., Tex., from observations of Mr. C. Runge, voluntary observer, Signal Service)

TEMPERATURE.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual mean.
1872	.....	.....	.....	.....	.....	.....	84.3	83.4	**81.1**	70.4	54.4	47.1	.....
1873	47.3	58.1	63.6	65.7	73.7	79.1	**80.7**	**84.4**	77.2	**65.8**	59.7	56.2	67.6
1874	54.4	55.6	65.2	**63.6**	74.2	80.1	82.3	82.5	76.3	70.1	63.3	57.4	68.8
1875	43.8	56.6	61.4	65.2	74.9	80.6	82.8	82.4	75.7	68.8	62.2	**60.9**	67.9
1876	59.6	59.1	59.6	69.1	74.4	79.8	83.2	83.8	**75.6**	70.1	56.6	**46.1**	68.1
1877	48.2	55.3	62.7	67.7	73.2	**78.2**	81.2	82.8	79.4	69.6	56.0	55.4	67.5
1878	50.6	55.6	67.8	**71.5**	76.0	81.6	83.1	80.9	77.5	71.6	61.1	48.2	68.8
1879	52.5	55.0	**68.4**	70.3	**77.4**	81.4	**85.0**	**79.4**	78.4	70.9	**65.6**	58.3	**70.2**
1880	**63.7**	56.4	60.8	**71.5**	75.7	79.9	80.6	82.4	76.1	66.0	**49.6**	51.4	67.8
1881	**43.2**	53.3	62.4	69.0	76.2	**85.0**	84.1	82.8	79.2	**73.9**	58.6	57.2	68.7
1882	55.8	**62.0**	66.4	71.2	73.7	80.3	82.0	**79.4**	76.8	73.3	60.5	54.2	69.6
1883	47.2	**52.6**	62.4	69.8	73.6	80.7	82.0	83.4	76.4	72.9	61.6	55.2	68.1
1884	44.0	56.3	63.4	65.0	72.2	79.0	84.2	82.6	80.0	69.9	57.9	.....	.....
1885	.....	.....	**58.0**	69.3	**72.0**	81.2	81.5	83.6	77.8	66.4	61.2	54.4	.....
1886	43.6	54.2	58.7	66.6	76.1	81.7	83.4	84.0	77.8	69.1	58.7	52.7	**67.2**
1887	49.6	59.2	64.2	68.9	75.1	79.2	83.3	83.4	78.3	67.0	59.8	48.8	68.1
Mean..	50.2	56.4	63.0	68.3	74.6	80.5	82.7	82.6	77.7	69.7	59.2	53.6	.....

PRECIPITATION.

1872	.....	.....	.....	.....	.....	.....	0.90	2.53	**0.90**	4.30	4.25	6.65	.....
1873	6.00	2.15	4.80	8.00	7.88	**11.3**	**14.4**	4.48	8.95	5.10	**14.9**	3.08	**91.1**
1874	2.23	6.94	8.45	4.30	2.90	3.76	6.46	1.96	**15.1**	0.79	5.81	8.96	67.64
1875	3.68	7.00	2.56	5.06	4.23	1.89	2.13	0.90	12.49	3.54	3.50	**16.4**	63.41
1876	3.43	2.46	7.15	1.08	6.13	3.23	8.13	2.60	3.53	1.73	1.13	2.63	43.23
1877	1.13	6.75	4.25	5.94	4.50	9.00	2.10	0.55	2.38	11.31	6.04	5.35	59.30
1878	4.88	3.56	2.35	1.88	3.56	4.38	5.44	8.38	5.06	1.19	6.96	5.00	52.64
1879	4.38	1.13	3.90	**6.44**	3.19	3.06	2.00	4.19	3.44	4.00	0.78	2.59	39.16
1880	6.44	7.15	9.13	4.13	6.22	4.59	8.75	4.06	4.25	3.50	8.63	0.44	67.29
1881	1.75	8.31	2.44	2.75	4.63	0.63	5.69	**5.63**	3.41	**12.4**	8.75	3.56	59.99
1882	**10.6**	**10.9**	4.81	2.94	12.25	0.81	2.44	4.63	3.88	5.94	7.63	2.25	**69.1**
1883	7.72	4.31	**13.1**	2.54	3.07	3.38	1.22	2.19	7.71	3.51	5.32	2.61	56.71
1884	3.43	2.58	4.86	4.68	**15.2**	2.82	**0.00**	0.21	5.18	1.78	5.05	**T.**	45.84
1885	**T.**	**1.06**	2.14	5.71	8.01	**0.51**	3.24	**0.09**	3.51	1.93	0.89	3.75	30.84
1886	1.13	1.65	4.75	2.01	**0.05**	0.68	2.10	4.64	7.81	**0.92**	1.50	0.97	28.21
1887	1.09	2.00	**1.27**	**0.17**	3.56	2.24	2.76	1.72	3.26	2.70	**0.48**	4.97	**26.2**
Mean..	4.13	4.53	5.07	3.84	5.70	3.49	4.23	3.05	5.68	4.04	5.10	4.62	.....

Precipitation, in inches and hundredths, by months and years, at Fort Gibson, Indian Territory.

Lat. 35° 50′, Long. 95° 20′.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual mean.
1836	.....	.....	.....	.....	.....	.....	3.10	5.90	8.04	3.05	2.08	1.20	.....
1837	3.01	1.00	1.90	4.30	4.45	6.10	2.46	0.50	6.72	0.52	3.30	0.40	34.66
1838	0.80	0.20	1.01	1.20	4.11	2.04	0.80	1.06	0.52	2.36	2.82	1.92	18.84
1839	2.36	1.45	1.35	2.10	1.10	4.65	*2.97	*2.69	*2.56	9.10	1.40	2.50	34.23
1840	4.08	1.20	1.40	†2.55	10.13	3.30	7.10	0.84	0.81	8.50	3.91	2.00	55.82
1841	3.23	0.60	4.90	2.35	2.83	2.09	1.41	2.56	2.43	4.50	8.15	1.20	36.25
1842	1.10	1.00	0.30	4.10	5.40	4.75	2.60	3.60	0.60	1.81	1.20	2.60	29.11
1843	7.40	0.70	1.31	2.71	2.59	3.32	2.30	8.18	2.11	2.15	1.94	0.90	35.61
1844	0.76	6.07	1.91	9.62	8.46	3.15	0.64	1.98	0.76	3.28	0.87	0.06	37.58
1845	1.36	0.80	2.95	8.68	2.01	2.18	1.45	1.63	1.44	3.49	0.85	0.03	26.67
1846	1.02	1.54	1.79	3.04	4.60	6.92	0.70	1.40	4.76	0.67	2.53	4.88	33.85
1847	0.10	2.12	1.42	3.10	1.35	3.88	1.89	1.78	0.95	3.10	3.35	1.06	24.10
1848	1.05	0.20	3.12	5.21	4.52	4.50	6.98	0.00	0.35	5.25	1.90	4.65	37.73
1849	2.19	0.88	4.90	2.17	7.52	9.17	8.72	3.70	2.05	4.05	4.49	2.90	52.65
1850	1.40	3.17	4.91	4.73	0.37	4.58	1.00	3.00	0.35	3.75	4.75	3.00	35.00
1851	0.50	10.42	1.50	0.50	3.20	6.45	1.25	1.15	3.14	9.35	7.10	7.70	52.46
1852	1.58	5.67	2.24	2.95	6.72	5.85	6.12	4.99	4.38	5.50	4.91	0.74	51.65
1853	0.82	2.27	1.06	3.52	6.65	1.60	0.76	4.72	1.35	1.13	1.30	0.70	25.88
1854	0.30	1.43	7.83	3.16	7.67	2.80	0.21	0.33	0.68	1.58	2.06	0.77	28.82
1855	0.93	0.48	0.57	3.63	5.65	4.85	0.74	5.34	4.13	2.35	4.50	2.49	35.66
1856	5.05	5.25	*2.52	5.70	2.75	1.75	0.76	3.50	1.80	6.60	1.20	3.10	39.98
1857	2.20	.....	1.48	.....	.....	0.00	.....	.....	.....	.....	.....	.....	.....
1873	*2.03	*2.28	*2.52	4.59	4.56	2.93	2.38	1.56	7.28	2.80	1.97	3.66	38.56
1874	3.69	3.44	2.91	5.83	3.54	3.35	1.99	1.54	4.41	0.81	4.64	2.70	38.88
1875	0.64	0.73	2.48	8.74	5.59	3.52	10.93	4.27	1.34	1.19	2.26	2.41	44.10
1876	4.94	0.04	5.67	1.85	1.94	0.82	6.06	0.94	2.43	1.10	2.89	0.20	35.48
1877	0.29	1.47	2.27	7.77	4.82	7.74	2.89	3.78	2.21	6.36	4.19	3.00	40.79
1878	2.79	2.40	1.44	2.83	7.52	0.01	4.68	1.70	2.32	1.53	0.35	2.53	36.70
1879	3.04	1.44	0.72	4.92	4.54	1.96	1.65	4.75	0.86	1.48	3.67	4.06	33.09
1880	0.30	1.94	4.40	2.44	2.64	4.26	3.61	2.82	1.89	3.22	2.34	0.68	30.54
1881	1.76	4.14	2.28	2.64	6.96	3.80	0.76	T.	2.79	0.07	3.13	2.92	37.85
1882	2.23	3.45	2.99	1.24	.....	.....	.....	.....	.....	.....	.....	.....	.....
1886	.....	.....	.....	.....	0.55	3.00	3.25	3.00	3.75	2.75	0.50	0.04	.....
Means.	2.03	2.28	2.52	4.25	4.49	4.13	2.97	2.69	2.56	3.55	2.92	2.16	36.55

*Interpolated.

Table of miscellaneous meteorological data for December, 1887—Signal Service observations.

Stations and districts.	Elevation above sea-level, feet.	Atmospheric pressure, in inches and hundredths.								Temperature of the air, in degrees Fahrenheit.												Mean relative humidity, per cent.	Mean temperature of dew-point, degrees Fahrenheit.	Precipitation, in inches.		Winds.					
		Mean actual barometer.	Departure from normal.	Mean reduced barometer.	Extremes.				Monthly range of barometer.	Monthly mean.	Departure from normal.	Extremes.				Mean max.	Mean min.	Monthly range.	Daily ranges.								Departure from normal precipitation, in inches.	Total movement, miles.	Prevailing direction.	Maximum velocity.		No. of rainy days.	No. of cloudy days.	No. of fair days.	No. of clear days.
					Highest barometer.	Date.	Lowest barometer.	Date.				Max.	Date.	Min.	Date.				Greatest.	Date.	Least.	Date.							Miles p. h.	Direction.	Date.				
New England.										31.7	+ 0.7													4.12	— 0.03							
Eastport	53	29.96	+.05	30.02	30.95	1	29.14	16	1.81	25.5	— 0.5	49.6	11	—10.0	31	18.4	59.6	29.5	28	6.2	20	76.3	18.4	5.59	+ 1.41	8,978	nw.	54	se.	28	13	11	7	13
Portland	99	29.93	+.03	30.04	30.96	1	28.99	18	1.97	27.9	— 1.1	54.8	12	34.5	— 1.8	31	21.2	56.6	30.8	28	6.3	21	75.5	20.8	5.17	+ 1.92	6,029	nw.	51	sw.	28	14	11	13	7
Manchester	247	29.80	.....	30.07	30.99	1	29.11	18	1.88	27.6	.....	55.5	12	35.4	— 3.3	31	20.2	58.8	41.2	28	6.3	21	75.0	19.9	3.30	.....	4,953	nw.	31	se.	28	13	9	15	7
Northfield	871	29.09	.....	30.09	31.02	1	29.28	18	1.74	20.9	.....	43.3	11	27.5	—21.1	31	12.6	64.3	31.6	29	4.2	18	83.7	16.5	5.88	.....	5,971	n.	40	nw.	16	15	11	15	5
Boston	135	29.93	+.02	30.06	30.96	1	29.02	18	1.94	32.1	+ 1.1	59.1	11	39.2	4.9	31	25.6	54.2	33.2	28	4.1	25	78.6	25.7	2.71	— 0.83	8,313	w.	56	ne.	18	11	9	15	7
Edgartown	.....	.....	.....	.....	.....	.....	.....	.....	.....	35.7	.....	57.2	12	41.5	10.9	31	29.9	46.3	26.1	29	4.8	21	.....	.....	1.78	.....	.....	nw.	.....	.....	..13	.....	.....	.....
Nantucket	14	30.04	.....	30.04	30.83	1	28.88	18	1.95	36.8	.....	57.7	12	42.8	13.0	31	30.4	44.7	25.5	29	3.9	23	78.9	30.6	4.60	.....	9,106	nw.	36	ne.	1	12	15	11	5
Wood's Holl	22	30.07	.....	30.08	30.90	1	28.91	18	1.99	34.7	.....	56.0	11	40.6	7.8	31	28.0	48.2	32.0	18	4.2	23	98.4	34.2	4.59	.....	12,336	nw.	.....	.....	..13	12	13	6
Vineyard Haven	.....	.....	.....	.....	.....	.....	.....	.....	.....	37.6	.....	60.0	11	45.9	9.0	31	29.3	51.0	31.2	29	0.0	11	.....	.....	3.53	.....	.....	nw.	.....	.....	..13	.....	.....	.....
Block Island	27	30.04	+.01	30.06	30.89	1	28.88	18	2.01	37.3	+ 1.3	58.0	11	41.8	12.0	31	30.5	45.4	23.1	2	5.3	9	83.2	32.3	2.70	— 2.22	14,227	nw.	72	ne.	18	13	10	14	7
Narragansett Pier	.....	.....	.....	.....	.....	.....	.....	.....	.....	34.2	.....	58.0	11	42.0	7.0	31	26.4	51.0	22.0	1	8.0	30	.....	.....	4.94	+ 0.97	.....	w.	.....	.....	..17	.....	.....	.....
New Haven	107	29.97	+.01	30.08	30.94	1	29.11	18	1.83	32.6	+ 1.6	55.5	11	39.6	7.5	1	25.4	48.0	25.8	28	4.7	11	78.8	26.3	3.09	— 2.49	6,460	n.	42	ne.	18	14	8	17	6
New London	47	30.00	—.02	30.04	30.91	1	28.90	18	2.01	35.0	+ 2.0	57.3	12	41.7	8.8	1	27.8	48.5	27.3	28	6.1	18	75.3	27.4	4.62	+ 1.02	5,717	nw.	60	se.	26	13	9	15	7
Mid. Atlantic States.										41.5	+ 0.5													4.45	— 0.99							
Albany	85	30.02	+.04	30.11	31.04	1	29.31	18	1.73	27.5	— 2.5	45.5	12	33.5	— 1.2	31	21.1	46.7	30.8	28	4.2	10	79.0	21.4	5.43	+ 2.82	4,328	nw.	27	nw.	22	15	13	13	5
New York City	185	29.90	—.02	30.09	30.92	1	29.26	18	1.66	36.1	+ 2.1	56.4	11	42.5	11.6	1	29.4	44.8	19.6	28	4.7	11	71.1	27.0	4.20	+ 0.99	7,546	nw.	50	w.	29	14	12	12	7
Philadelphia	117	30.01	+.02	30.13	30.93	1	29.34	17	1.59	36.9	+ 1.9	58.9	10	43.8	14.5	29	30.4	44.4	20.2	28	6.9	11	71.4	27.8	5.06	+ 2.42	7,855	nw.	45	nw.	28	11	11	14	6
Atlantic City	34	30.10	+.03	30.12	30.88	1	29.20	17	1.68	36.7	+ 0.7	56.0	28	44.7	14.5	1	28.8	41.5	29.6	28	6.5	26	81.6	31.3	4.51	+ 0.18	6,030	w.	48	w.	17	14	7	16	8
New Brunswick	.....	.....	.....	.....	.....	.....	.....	.....	.....	41.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Baltimore	45	30.10	+.01	30.13	30.92	1	29.41	17	1.51	37.2	+ 0.2	58.6	11	43.0	15.9	29	30.9	42.7	23.8	28	3.6	15	67.8	26.6	5.04	+ 1.91	4,176	nw.	33	nw.	29	10	11	12	8
Washington City	100	30.04	+.02	30.14	30.91	1	29.43	17	1.48	37.2	+ 2.2	59.0	11	43.7	14.2	30	29.9	44.8	25.5	28	4.6	15	69.7	27.2	4.31	+ 1.27	4,498	nw.	33	nw.	29	11	11	15	5
Cape Henry	.....	.....	.....	.....	.....	.....	.....	.....	.....	43.7	.....	69.9	10	51.1	20.3	31	36.4	49.6	30.0	29	3.5	20	.....	.....	3.14	— 1.24	.....	nw.	.....	.....	.....	.....	.....	.....
Lynchburg	652	29.43	.00	30.12	30.83	1	29.47	17	1.36	37.9	— 0.1	62.4	11	45.6	12.9	30	30.2	49.5	31.4	7	5.3	26	70.1	27.3	4.28	+ 0.48	2,082	nw.	26	nw.	29	14	11	12	8
Norfolk	30	30.11	+.01	30.12	30.74	1	29.25	17	1.49	42.5	— 0.5	63.7	10	50.1	18.8	30	35.6	44.9	28.3	28	3.5	24	81.6	36.8	4.01	+ 0.07	5,242	n.	30	nw.	28	13	10	12	9
S. Atlantic States.										49.0	— 0.6													5.55	+ 1.41							
Charlotte	808	29.26	—.02	30.11	30.69	1	29.54	17	1.15	42.1	+ 0.1	62.8	4	50.0	16.3	30	34.1	46.5	26.5	28	6.5	9	72.9	32.8	4.94	— 0.36	3,972	ne.	28	w.	28	13	12	14	5
Hatteras	11	30.14	+.02	30.13	30.59	1	29.29	17	1.30	47.9	+ 0.9	64.9	11	57.1	23.8	30	43.1	41.1	29.7	31	7.2	10	87.6	44.3	6.96	+ 0.59	10,798	n.	48	w.	17	12	12	13	6
Kitty Hawk*	.....	.....	.....	.....	.....	.....	.....	.....	.....	46.6	.....	66.0	15	55.7	18.7	30	37.5	47.3	33.8	18	5.9	25	.....	.....	4.13	— 1.11	.....	ne.	.....	.....	12	.....	.....	.....
Raleigh	375	29.74	.....	30.13	30.72	1	29.45	17	1.27	41.1	.....	65.7	4	48.6	14.8	30	33.6	50.9	32.6	7	3.8	17	78.4	34.5	4.99	.....	4,430	nw.	25	nw.	28	11	14	12	5
Southport	.....	.....	.....	.....	.....	.....	.....	.....	.....	48.4	.....	66.4	5	56.5	19.5	30	40.4	46.9	34.0	29	5.9	10	.....	.....	7.78	+ 4.30	.....	n.	.....	.....	..11	.....	.....	.....
Wash Woods †	.....	.....	.....	.....	.....	.....	.....	.....	.....	42.4	.....	62.0	15	49.2	19.4	30	35.5	42.6	27.8	29	3.4	26	.....	.....	3.04	— 0.03	.....	n.	.....	.....	..10	.....	.....	.....
Wilmington	52	30.06	—.05	30.09	30.58	1	29.39	17	1.19	48.1	— 0.9	67.0	15	56.4	19.0	30	38.9	48.0	28.6	3	5.3	10	75.4	40.0	4.41	+ 0.72	4,837	ne.	36	w.	17	13	11	11	9
Charleston	52	30.08	—.02	30.10	30.55	1	29.50	24	1.05	51.1	— 0.9	73.4	5	57.3	29.1	30	44.3	44.3	27.4	31	5.2	23	80.5	44.7	7.91	+ 4.24	5,701	ne.	26	w.	28	10	13	10	8
Columbia	.....	.....	.....	.....	.....	.....	.....	.....	.....	46.3	.....	67.0	5	52.6	23.3	30	37.2	43.7	29.2	7	4.0	14	78.3	39.2	3.73	.....	.....	.....	.....	.....	..11	14	11	6
Augusta	183	29.96	—.03	30.13	30.66	1	29.53	24	1.13	47.5	— 0.5	72.0	4	55.2	24.1	29	38.4	47.9	31.7	7	6.5	9	70.4	37.2	4.64	+ 0.83	2,872	ne.	20	ne.	9	11	16	9	6
Savannah	87	30.05	—.02	30.11	30.55	1	29.53	24	1.02	50.8	— 2.2	70.6	5	58.2	28.0	30	43.2	42.6	34.0	31	3.9	23	77.8	43.3	7.99	+ 4.46	4,855	nw.	30	w.	17	10	9	16	6
Jacksonville	43	30.08	—.04	30.09	30.47	29	29.49	24	0.98	55.6	— 0.4	76.3	24	64.3	31.0	29	47.0	45.3	31.8	27	5.1	2	84.8	50.8	3.70	+ 0.41	4,934	n.	36	w.	17	13	13	15	3
Florida Peninsula.										64.8	+ 1.2													3.22	— 0.76							
Cedar Keys	22	30.08	—.05	30.06	30.44	29	29.59	24	0.85	57.5	+ 0.5	72.8	6	64.1	33.8	29	51.1	39.0	21.3	30	5.8	5	82.7	51.9	3.64	— 0.50	7,695	ne.	33	ne.	14	12	8	17	6
Key West	22	30.06	—.04	30.03	30.24	29	29.77	24	0.47	72.0	+ 2.0	80.5	28	75.7	62.7	10	67.5	17.8	12.3	10	4.3	12	65.5	80.5	2.79	+ 1.02	8,084	e.	32	n.	29	17	5	20	6
Titusville	12	30.10	.....	30.07	30.38	29	29.60	24	0.78	63.2	.....	81.0	24	69.9	40.2	19	55.6	40.8	26.8	19	8.8	1	79.2	56.4	1.91	.....	6,188	nw.	45	n.	1	13	9	16	6
Eastern Gulf States.										48.9	— 2.1													7.13	+ 2.06							
Atlanta	1,129	28.94	—.02	30.12	30.63	1	29.46	24	1.17	42.3	— 1.7	64.9	4	48.8	15.3	29	34.5	49.6	31.2	28	5.8	23	72.9	33.2	5.79	+ 0.47	8,076	e.	33	nw.	28	13	15	9	7
Pensacola	30	30.06	—.07	30.04	30.51	29	29.58	24	0.93	53.5	— 0.5	70.0	8	59.6	30.1	29	47.2	39.9	23.1	28	6.3	17	82.2	47.9	6.89	+ 1.76	6,325	ne.	30	sw.	24	16	10	10	5
Mobile	35	30.06	—.07	30.06	30.57	29	29.60	24	0.97	50.8	— 1.2	69.3	6	57.8	25.4	29	43.1	43.9	27.1	28	5.0	23	83.1	45.4	7.21	+ 2.63	6,528	n.	35	sw.	28	15	15	14	2
Montgomery	217	29.89	—.05	30.10	30.59	29	29.48	24	1.11	47.8	— 1.2	67.8	4	54.6	22.0	29	39.5	45.8	31.4	28	6.0	14	72.0	37.9	8.25	+ 3.15	4,939	e.	24	nw.	28	16	19	6	6
Vicksburg	222	29.86	—.07	30.07	30.65	29	29.51	31	1.14	46.3	— 4.7	73.0	3	53.4	21.5	29	39.8	51.5	30.4	28	2.6	9	81.0	39.9	7.07	+ 1.64	4,997	se.	30	w.	31	19	21	6	4
Oxford	.....	.....	.....	.....	.....	.....	.....	.....	.....	42.1	.....	63.9	4	48.2	16.4	29	34.6	47.5	27.5	28	3.6	10	77.0	34.8	0.32	.....	.....	.....	.....	.....	..15	15	13	3
New Orleans	52	30.02	—.07	30.04	30.56	29	29.65	24	0.91	52.9	— 3.1	77.0	7	59.7	29.4	30	46.3	47.6	29.2	30	4.7	14	81.1	46.7	7.56	+ 2.69	6,625	ne.	33	s.	31	15	15	11	5
Western Gulf States.										46.5	— 3.5													0.28	+ 2.69							
Shreveport	227	29.85	—.07	30.06	30.62	28	29.50	31	1.12	45.4	— 3.6	74.0	3	53.3	20.0	21	39.5	54.0	31.1	30	4.6	9	83.5	40.3	6.72	+ 1.63	4,441	n.	25	w.	31	18	16	9	6
Fort Smith	470	29.61	—.02	30.10	30.68	28	29.57	31	1.11	38.4	— 1.6	71.5	3	47.1	8.0	21	30.9	63.5	35.6	27	4.2	13	72.3	30.1	4.22	+ 1.58	4,446	se.	24	nw.	27	13	12	10	9
Little Rock	309	29.77	—.06	30.08	30.71	29	29.47	31	1.34	41.0	— 2.0	65.0	3	47.5	13.5	29	33.9	51.5	28.3	31	2.7	8	75.6	34.8	7.14	+ 2.69	5,053	n.	26	ne.	8	15	14	10	7
Corpus Christi	18	30.05	.....	30.04	30.54	28	29.61	31	0.93	52.6	— 6.4	76.5	2	59.8	24.4	22	45.3	52.1	26.5	28	5.2	23	83.9	47.4	5.07	.....	8,621	n.	39	nw.	13	14	16	6	9
Galveston	40	30.05	—.05	30.05	30.54	28	29.60	31	0.94	53.3	— 3.7	74.0	2	58.8	29.2	22	47.4	44.8	24.0	28	4.3	15	82.0	47.5	10.28	+ 5.68	8,401	n.	32	n.	28	17	18	6	7
Palestine	533	29.53	—.05	30.10	30.60	28	29.62	31	0.98	45.6	— 3.4	78.8	3	54.1	10.6	21	38.4	68.2	31.4	27	7.0	7	81.1	39.3	6.72	+ 3.79	7,533	n.	36	nw.	20	16	17	9	5
San Antonio	781	29.26	—.06	30.05	30.57	28	29.60	31	0.97	49.4	— 3.6	74.3	3	58.4	22.0	21	41.1	52.3	39.4	17	5.0	22	71.3	39.4	2.58	+ 0.79	6,716	n.	32	ne.	28	14	13	8	10
Rio Grande Valley.										55.4	— 5.2													4.04	+ 3.07							
Brownsville	57	30.02	—.04	30.03	30.51	28	29.58	31	0.93	56.5	— 4.5	79.1	3	65.5	26.2	22	49.6	52.9	27.0	24	6.9	23	85.6	51.8	4.80	+ 2.89	6,042	n.	26	s.	31	10	12	10	9
Rio Grande City	230	29.89	—.03	30.10	30.59	28	29.63	31	0.90	54.2	— 5.8	83.0	3	62.7	25.4	22	43.3	57.6	37.1	9	5.3	22	75.8	45.4	4.38	+ 3.25	4,076	n.	24	n.	28	10	6	17	8
Ohio Val. & Tenn.										56.6	— 0.7													3.70	— 0.19							
Chattanooga	783	29.32	—.02	30.14	30.63	29	29.57	24	1.06	40.1	— 1.9	59.5	5	47.7	13.3	29	33.6	46.2	27.1	28	6.5	10	79.4	33.6	5.46	+ 0.15	4,479	s.	36	nw.	28	17	17	11	3
Knoxville	980	29.10	—.02	30.14	30.65	29	29.65	24	1.00	39.0	— 1.0	64.0	4	46.5	13.0	29	31.8	50.4	27.7	28	4.8	24	75.0	30.9	3.49	— 1.04	3,846	ne.	30	sw.	20	18	16	9	6
Memphis	320	29.76	—.06	30.08	30.67	29	29.49	31	1.18	40.6	— 1.4	62.0	4	48.0	14.5	21	34.0	47.5	26.5	6	4.0	9	73.5	31.8	5.80	+ 1.87	5,142	w.	36	w.	28	14	13	12	6
Nashville	549	29.53	—.03	30.10	30.68	29	29.52	31	1.16	38.5	— 1.5	59.0	4	46.0	6.3	29	31.2	52.7	31.5	28	7.1	12	78.5	31.8	5.31	+ 1.67	4,897	se.	31	nw.	28	17	17	7	7
Lexington	.....	29.04	.....	.....	.....	.....	.....	.....	.....	35.3	.....	60.2	3	43.7	2.9	29	26.8	57.3	40.5	28	6.3	18	74.8	27.5	2.71	.....	5,704	se.	36	se.	31	12	18	8	5
Louisville	551	29.53	—.02	30.11	30.70	29	29.56	31	1.14	30.5	— 1.5	60.2	3	43.8	4.0	29	28.5	56.2	35.1	28	4.7	17	72.5	28.1	3.03	— 1.27	5,766	n.	36	se.	20	13	17	10	4
Indianapolis	706	29.20	—.03	30.10	30.72	1	29.31	31	1.21	30.8	— 0.2	57.0	4	37.6	— 3.0	29	23.2	60.0	36.8	28	3.5	10	78.9	24.5	4.52	+ 1.14	4,590	se.	25	w.	28	12	15	11	5
Terre Haute	.....	.....	.....	.....	.....	.....	.....	.....	.....	31.7	.....	60.1	10	40.0	2.5	29	23.4	62.6	28.2	28	4.9	16	.....	.....	4.48	.....	.....	.....	.....	.....	..13	.....	.....	.....
Cincinnati	628	29.43	—.03	30.11	30.74	1	29.58	31	1.16	34.7	— 0.3	58.8	4	42.3	1.3	29	26.4	57.5	38.8	28	6.5	8	71.7	26.1	1.80	— 1.90	5,663	se.	32	sw.	21	11	20	8	3
Columbus	812	29.23	—.01	30.11	30.81	1	29.63	17	1.18	33.0	— 1.0	56.6	4	39.9	0.6	29	25.6	56.0	37.4	28	6.0	18	72.5	24.6	1.87	— 1.47	6,128	w.	34	sw.	21	14	16	11	4
Pittsburg	847	29.18	—.01	30.09	30.86	1	29.53	17	1.33	30.3	+ 2.3	61.5	4	43.2	7.5	29	28.8	54.0	33.5	28	4.5	24	71.1	27.3	1.99	— 0.87	5,721	w.	34	sw.	28	14	16	11	4
Lower lake region.										30.1	+ 0.4													4.59	— 0.74							
Buffalo	690	29.32	+.03	30.08	31.00	1	29.47	28	1.53	30.8	+ 1.8	53.0	4	36.1	6.1	29	25.7	46.9	21.6	31	5.3	21	77.7	24.3	2.27	— 1.18	9,039	w.	54	w.	28	19	20	8	3
Oswego	335	29.70	+.02	30.08	31.02	1	29.47	18	1.55	28.4	— 0.6	52.2	11	34.5	0.5	31	22.9	51.7	26.4	2	2.9	25	84.4	24.0	2.25	— 1.31	9,475	se.	45	w.	29	16	23	7	1
Rochester	621	29.36	—.01	30.05	30.99	1	29.46	18	1.53	29.1	+ 1.1	52.4	4	35.5	3.2	1	23.8	49.2	24.6	2	4.9	23	82.9	24.0	1.58	— 1.35	8,313	w.	48	w.	29	16	20	7	4
Erie	681	29.32	.00	30.06	30.93	1	29.52	17	1.41	32.2	+ 1.2	58.5	4	41.2	7.8	1	25.5	50.7	35.8	28	4.3	26	81.0	26.7	3.13	— 0.33	8,262	s.	43	w.	29	22	22	6	3
Cleveland	690	29.32	—.01	30.08	30.83	1	29.58	17	1.25	31.6	+ 1.6	57.0	4	37.3	4.7	28	24.1	52.3	35.3	28	2.9	12	77.7	25.1	2.06	— 0.69	8,046	sw.	35	s.	31	19	19	10	2
Sandusky	638	29.40	.00	30.10	30.85	1	29.60	17	1.25	30.5	+ 0.5	57.9	4	37.1	1.0	29	23.2	56.9	37.0	28	4.2	20	78.6	24.2	1.90	— 0.90	7,827	sw.	42	w.	28	9	13	15	3
Toledo	651	29.37	—.01	30.08	30.85	1	29.56	31	1.29	29.0	— 1.0	57.7	4	35.5	1.8	28	22.2	55.9	34.2	28	5.1	8	79.3	23.0	2.78	+ 0.25	5,774	sw.	32	w.	28	11	18	9	4
Detroit	662	29.34	—.01	30.07	30.87	1	29.57	28	1.30	29.5	— 1.5	54.8	4	34.5	7.0	30	24.2	47.8	20.5	28	3.0	12	81.2	24.1	2.34	— 0.39	7,778	w.	30	sw.	28	15	19	11	1
Upper lake region.										30.0	+ 1.8													3.20	+ 0.98							
Alpena	609	29.35	+.01	30.04	30.88	1	29.43	28	1.45	27.1	+ 4.1	54.0	4	31.2	5.6	30	22.0	48.4	22.0	4	3.2	26	88.5	23.9	4.57	+ 2.21	7,788	w.	39	se.	31	21	24	7	0
Escanaba	608	29.33	—.01	30.02	30.67	1	29.43	31	1.24	24.8	— 3.8	41.5	4	30.4	— 5.7	28	18.4	47.2	23.1	30	3.6	9	82.0	19.9	3.73	+ 1.95	6,695	sw.	30	nw.	28	18	21	8	2
Grand Haven	620	29.32	—.05	30.00	30.72	1	29.39	31	1.33	29.7	+ 0.7	52.9	4	34.8	4.7	28	24.1	48.2	28.7	21	2.4	17	84.5	25.2	3.96	+ 1.40	9,508	sw.	40	w.	4	24	26	4	1
Lansing	870	29.09	.....	30.07	30.81	1	29.53	31	1.28	27.1	.....	53.9	4	33.0	0.8	30	21.6	53.1	23.9	4	3.3	12	85.1	24.0	3.16	.....	6,335	sw.	34	sw.	4	16	20	10	1
Mackinaw City	605	29.35	+.01	30.03	30.84	1	29.55	31	1.29	26.6	— 3.6	48.7	4	30.8	7.0	29	21.3	41.7	18.3	1	2.9	27	85.2	22.5	1.08	— 2.16	10,969	nw.	60	se.	31	19	25	6	0
Marquette	672	29.27	.00	30.04	30.62	1	29.48	4	1.14	24.7	+ 2.7	42.4	4	28.9	3.9	30	19.2	38.5	18.2	6	3.9	28	76.0	18.2	2.32	+ 0.20	7,567	nw.	36	sw.	9	24	24	6	1
Port Huron	639	29.37	+.02	30.08	30.91	1	29.51	28	1.40	28.7	+ 2.7	52.3	4	33.4	5.8	30	22.5	46.5	22.1	31	3.0	25	85.2	24.3	2.22	— 0.16	8,930	sw.	37	sw.	28	16	20	9	2
Chicago	715	29.27	—.04	30.04	30.69	29	29.42	31

Table of miscellaneous meteorological data for December, 1887—Signal Service observations—Continued.

Stations and districts.	Elevation above sea-level, feet.	Atmospheric pressure, in inches and hundredths.									Temperature of the air, in degrees Fahrenheit.														Mean relative humidity, per cent.	Mean temperature of dew-point, degrees Fahrenheit.	Precipitation, in inches.		Winds.				Maximum velocity.		Date.	No. of rainy days.	No. of cloudy days.	No. of fair days.	No. of clear days.
		Mean actual barometer.	Departure from normal.	Mean reduced barometer.	Extremes.						Monthly mean.	Departure from normal.	Extremes.						Monthly range.	Daily ranges.																		
					Highest barometer.	Date.	Lowest barometer.	Date.	Monthly range of barometer.				Max.	Date.	Mean max.	Min.	Date.	Mean min.		Greatest.	Date.	Least.	Date.					Total movement, miles.	Prevailing direction.	Miles p. h.	Direction.						
Upper Miss. Valley.											26.0	— 1.6																								
Saint Paul	831	29.10	—.06	30.03	30.81	29	29.32	31	1.49		17.1	— 0.9	41.1	17	26.0	—22.4	29	8.6	63.5	39.7	12	3.3	9	85.4		13.2	1.47	+ 0.17	3,704	W.	26	E.	3	16	17	11	3
La Crosse	744	29.23	—.04	30.06	30.83	29	29.28	31	1.55		21.3	— 0.7	42.5	4	28.8	—21.4	29	14.0	63.9	32.9	4	2.5	19	85.8		17.4	1.32	— 0.04	5,928	S.	29	SW.	4	13	18	9	4
Davenport	615																																				
Des Moines	866	29.11	—.08	30.06	30.80	29	29.34	31	1.46		22.9	— 2.1	50.4	3	31.8	—12.6	28	14.5	63.0	32.6	27	2.9	10	81.0		17.5	1.41	— 0.09	6,056	NW.	32	NW.	23	11	11	13	7
Dubuque	665	29.31	—.07	30.05	30.80	29	29.28	31	1.52		22.9	— 1.1	49.6	4	30.7	—15.5	29	14.8	65.1	33.5	4	2.6	10	81.1		17.9	3.07	+ 1.23	2,897	S.	20	SW.	31	11	15	10	6
Keokuk	618	29.38	—.07	30.05	30.74	29	29.40	31	1.34		27.3	— 0.7	57.0	3	35.6	—11.4	28	19.6	64.8	33.6	27	3.8	9	80.3		21.8	2.73	+ 0.58	7,246	NW.	30	SW.	31	10	7	14	10
Cairo	359	29.73	—.05	30.10	30.71	29	29.55	31	1.16		36.3	— 1.7	58.2	14	44.7	5.0	29	29.1	53.2	29.0	28	5.8	8	70.8		26.5	4.12	+ 0.56	6,293	S.	48	W.	20	13	14	11	6
Springfield	644	29.39	—.05	30.09	30.76	29	29.45	31	1.31		28.3	— 2.7	56.3	3	35.8	—10.2	28	20.3	60.5	32.1	20	3.8	2	75.4		21.2	3.35	+ 0.40	6,893	S.	36	S.	3	9	12	13	6
Saint Louis	571	29.46	—.06	30.08	30.74	29	29.44	31	1.30		31.5	— 2.5	58.0	3	39.9	— 2.0	28	23.7	60.0	35.5	20	4.0	2	77.4		24.7	3.54	+ 1.10	8,905	NW.	30	NW.	20	10	14	9	8
Forest Park	.....	29.58	.....	.....	.....	.....	.....	.....	.....		30.0	.....	57.0	3	38.7	— 3.0	28	21.1	60.0	36.7	20	3.9	9	83.8		25.9	2.72	.....	5,835	W.	30	NW.	28	12	14	7	9
Missouri Valley.											18.6	— 3.1															1.56	+ 0.82								
Lamar	1,028	29.01	.....	30.13	30.77	28	29.49	31	1.28		30.7	.....	61.2	3	40.5	— 5.1	28	21.9	66.3	33.2	31	5.8	10	75.4		23.1	2.09	+ 1.23	7,676	NW.	36	S.	30	10	10	10	11
Springfield	1,356	28.62	.....	30.09	30.72	28	29.51	31	1.21		31.5	.....	64.0	3	42.2	— 4.8	28	23.3	68.8	42.1	20	7.0	26	80.2		25.7	2.39	.....	8,443	SE.	44	SE.	30	13	9	12	10
Leavenworth	842	29.19	—.05	30.10	30.77	28	29.50	31	1.27		27.2	— 2.8	62.2	3	37.4	— 9.8	28	19.2	72.0	34.8	27	6.1	10	74.2		19.5	2.55	+ 0.94	5,454	NW.	28	NW.	20	7	7	10	14
Topeka	.....	.....	.....	.....	.....	.....	.....	.....	.....		27.6	.....	58.2	3	38.6	— 9.1	28	17.9	67.3	30.8	23	7.9	10	78.6		21.3	0.89	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Omaha	1,113	28.88	—.05	30.10	30.80	28	29.37	31	1.43		23.6	— 0.4	48.0	5	33.2	—14.5	28	15.5	62.5	36.9	22	4.0	9	72.5		15.4	1.11	+ 0.08	6,868	NW.	42	NW.	19	6	9	13	9
Crete	.....	.....	.....	.....	.....	.....	.....	.....	.....		23.0	.....	49.7	17	33.0	—15.4	28	18.9	65.1	34.0	22	6.0	9	83.0		18.1	0.87	.....	.....	.....	.....	.....	.....	.....	.....	.....	6	9	15	7
Valentine	2,614	27.27	.....	30.09	30.76	28	29.52	30	1.25		19.7	— 1.3	51.8	12	32.5	—28.6	28	8.6	80.4	36.0	7	8.9	13	71.9		11.1	0.53	+ 0.43	8,900	NW.	48	NW.	4	6	7	14	9
Fort Sully	1,600	28.32	.....	30.10	30.71	28	29.62	18	1.09		13.9	— 4.1	46.0	16	23.3	—17.9	29	3.4	63.9	38.8	22	6.5	20	80.1		8.6	0.50	— 0.01	6,820	W.	43	W.	3	9	4	19	8
Huron	1,307	28.64	—.04	30.11	30.81	28	29.62	18	1.19		10.0	— 7.0	39.7	18	20.2	—23.0	29	— 0.3	62.7	54.1	22	9.1	9	77.4		4.0	2.09	+ 1.70	8,191	NW.	48	N.	19	15	9	16	6
Yankton	1,234	28.69	—.09	30.07	30.76	29	29.50	31	1.26		17.2	— 2.6	45.2	18	26.7	—16.4	29	8.0	61.6	53.2	22	4.8	28	78.8		11.7	2.07	+ 1.35	6,423	NW.	34	N.	21	14	7	17	7
Northern slope.											22.2	— 2.8															0.62	— 0.22								
Fort Assinaboine	2,690	27.14	—.07	30.10	30.94	20	29.61	17	1.33		13.3	— 6.7	52.0	7	22.0	—29.8	20	3.8	81.8	52.8	21	3.4	26	65.8		3.5	0.63	— 0.09	8,923	W.	45	W.	7	8	10	17	4
Fort Custer	3,040	26.82	—.03	30.08	30.87	20	29.66	17	1.21		21.5	— 0.5	57.6	17	31.4	—20.3	28	9.3	77.9	37.6	21	7.4	27	67.2		10.7	0.44	— 0.52	4,853	N.	36	N.	19	10	5	21	5
Fort Maginnis	4,320	25.38	—.12	29.92	30.35	10	29.52	2	0.83		20.0	.....	53.7	7	29.1	—13.6	31	9.1	67.3	37.5	21	6.6	30	83.9		15.6	0.42	.....	6,762	NW.	57	NW.	3	6	12	7	2
Helena	4,069	25.78	—.05	30.07	30.73	20	29.56	2	1.17		23.0	0.0	54.5	7	31.0	—13.2	31	14.9	67.7	27.5	23	2.7	16	62.5		11.2	0.29	— 1.03	4,238	SW.	36	SW.	16	4	11	19	1
Poplar River	2,002	27.88	—.02	30.13	30.95	20	29.55	17	1.40		5.6	— 4.4	43.0	16	17.9	-29.3	28	— 6.1	72.3	42.2	21	7.1	30	80.6		0.6	0.28	— 0.10	4,653	W.	52	W.	19	9	3	16	12
Deadwood	4,600	25.27	—.04	30.09	30.55	13	29.62	30	0.93		22.6	— 2.4	49.1	7	32.4	—10.9	27	14.0	60.0	40.0	30	6.9	31	79.6		16.8	1.65	+ 0.15	2,109	SW.	20	SW.	4	14	7	18	6
Cheyenne	6,105	23.89	—.05	30.02	30.65	14	29.25	30	1.40		26.6	— 2.4	56.0	8	37.6	—12.8	21	14.0	68.8	38.6	29	11.0	25	55.0		8.0	0.35	+ 0.14	9,805	NW.	48	S.	12	9	3	19	9
North Platte	2,841	27.06	—.05	30.10	30.64	28	29.50	30	1.14		22.5	— 3.5	56.0	12	34.2	—18.2	20	11.5	74.2	39.0	22	7.8	13	75.4		15.5	0.30	— 0.44	6,615	NW.	37	N.	19	7	6	11	14
Middle slope.											28.3	— 2.4															0.49	— 2.69								
Colorado Springs	.....	.....	.....	.....	.....	.....	.....	.....	.....		28.5	.....	56.3	12	41.7	—13.6	21	14.7	69.9	43.9	8	10.0	2	59.5		14.7	0.08	.....	.....	.....	.....	.....	.....	.....	.....	.....	5	2	14	15
Denver	5,281	24.68	—.03	30.05	30.71	21	29.20	30	1.51		28.8	— 5.2	66.6	12	44.0	—13.6	21	16.7	80.2	39.2	5	15.5	23	52.0		11.6	0.14	— 0.60	5,186	S.	36	W.	30	5	3	11	17
Las Animas	3,899	26.00	—.03	30.05	30.68	21	29.20	30	1.48		27.6	— 1.4	57.8	26	42.0	—11.3	21	14.3	69.1	46.8	30	10.9	20	63.5		14.5	0.32	— 0.37	4,354	W.	48	W.	30	2	2	17	12
Concordia	1,384	28.58	.....	30.08	30.74	28	29.32	30	1.42		26.6	— 1.2	53.3	17	37.0	—10.1	28	17.5	63.4	37.1	27	5.5	9	67.0		10.5	0.63	+ 0.13	6,061	NW.	36	NW.	31	3	6	10	15
Dodge City	2,523	27.40	—.04	30.10	30.69	21	29.38	30	1.31		28.9	— 2.1	60.3	8	42.0	— 9.0	21	16.7	69.3	36.9	16	7.7	25	71.3		19.2	0.54	— 0.22	7,293	NE.	36	N.	19	5	3	8	20
Fort Reno	.....	.....	.....	.....	.....	.....	.....	.....	.....		32.7	.....	66.0	3	43.3	— 1.5	21	22.1	67.5	.....	.....	.....	.....	.....		.....	0.74	— 0.96	.....	N.	.....	.....	.....	.....	.....	9	.....	.....
Fort Supply	.....	.....	.....	.....	.....	.....	.....	.....	.....		37.4	.....	70.5	17	51.4	0.0	21	23.4	70.5	56.0	17	13.8	31	.....		.....	1.01	+ 0.15	.....	S.	.....	.....	.....	7	.....	.....	.....
Fort Elliott	2,700	27.26	—.02	29.99	30.61	21	29.34	30	1.27		32.7	— 2.3	61.9	8	46.6	— 3.5	21	21.2	65.4	38.9	16	6.1	14	73.9		24.1	0.08	— 0.82	9,369	NW.	52	NW.	27	4	5	12	14
Southern slope.											42.3	— 5.0															0.92	+ 0.07								
Fort Sill	1,200	28.83	—.03	30.10	30.68	28	29.50	30	1.18		36.7	— 3.3	68.0	3	47.1	7.6	21	28.1	60.4	34.2	23	5.0	25	74.9		28.9	0.91	— 1.01	8,253	N.	60	N.	14	10	5	12	14
Abilene	1,748	28.24	.....	30.06	30.59	28	29.55	30	1.04		40.3	— 5.7	69.1	3	49.9	10.8	21	30.9	58.3	42.8	27	9.6	15	81.4		34.6	1.58	+ 1.09	8,668	NE.	40	N.	20	8	8	10	13
Fort Davis	4,928	25.14	—.08	30.02	30.43	21	29.58	31	0.85		40.0	— 6.0	68.0	30	50.9	1.3	23	30.3	66.7	35.1	8	7.9	15	44.1		18.2	0.25	— 0.10	7,255	SW.	38	SW.	30	5	3	10	18
Fort Stanton	6,150	23.88	.....	29.91	30.34	21	29.34	30	1.00		30.0	.....	57.1	26	42.9	—18.2	22	17.6	75.3	37.7	26	9.8	30	61.4		17.1	0.93	+ 0.31	6,451	NW.	50	SW.	30	8	1	14	16
Southern plateau.											37.4	— 5.6															0.75	— 0.55								
El Paso	3,764	26.27	—.04	30.06	30.38	15	29.62	30	0.76		40.2	— 4.8	68.8	30	52.7	— 2.4	23	28.7	71.2	36.4	2	10.0	15	63.7		27.8	1.01	+ 0.34	3,379	NW.	26	E.	14	7	4	5	22
Lava	.....	.....	.....	.....	.....	.....	.....	.....	.....		33.2	.....	64.0	1	48.0	— 3.2	22	18.5	67.2	.....	.....	.....	.....	.....		.....	0.11	— 0.47	.....	SW.	.....	.....	.....	5	.....	.....	.....
Santa Fé	7,026	23.18	—.05	30.07	30.42	15	29.48	30	0.94		26.8	— 5.2	45.5	29	36.1	— 8.0	22	17.9	53.5	30.5	22	8.9	1	59.5		13.3	0.32	— 0.50	3,973	N.	36	W.	30	4	4	10	17
Fort Apache	5,020	25.02	—.04	30.10	30.40	15	29.75	30	0.65		33.4	— 4.6	57.2	29	48.9	1.1	22	21.2	50.1	41.2	18	11.9	2	69.4		23.3	0.57	— 1.37	4,265	SW.	36	NE.	22	6	4	7	20
Fort Bowie	.....	.....	.....	.....	.....	.....	.....	.....	.....		38.5	.....	57.9	29	47.1	6.5	22	29.9	51.4	.....	.....	.....	.....	.....		.....	1.94	— 0.42	.....	SW.	.....	.....	.....	8	.....	.....	.....
Fort Grant	4,914	25.17	—.09	30.04	30.30	15	29.77	30	0.53		39.4	— 6.6	63.5	30	50.8	7.4	22	29.1	56.1	34.4	23	11.2	31	47.6		19.1	0.21	— 1.35	4,644	W.	48	E.	21	5	6	3	22
Fort McDowell	.....	.....	.....	.....	.....	.....	.....	.....	.....		43.7	.....	68.0	29	57.6	15.0	23	29.8	53.0	36.0	17	13.0	14	.....		.....	0.77	— 1.83	.....	W.	.....	.....	.....	2	.....	.....	.....
Fort Thomas	2,710	.....	.....	.....	.....	.....	.....	.....	.....		39.5	.....	64.3	29	52.0	8.5	23	27.0	55.8	33.9	25	6.3	21	.....		.....	1.05	— 0.25	.....	SE.	.....	.....	.....	7	.....	.....	.....
Fort Verde	.....	.....	.....	.....	.....	.....	.....	.....	.....		38.7	.....	61.0	29	53.6	14.0	22	23.8	47.0	.....	.....	.....	.....	.....		.....	0.87	.....	.....	.....	.....	.....	.....	3	.....	.....	.....
Prescott	5,389	24.71	—.04	30.09	30.39	15	29.70	2	0.69		31.7	— 8.3	57.0	18	43.8	7.5	22	21.0	49.5	37.8	23	5.5	2	70.8		22.1	0.82	— 0.90	4,344	NE.	48	SW.	30	5	3	6	22
San Carlos	.....	.....	.....	.....	.....	.....	.....	.....	.....		40.4	.....	65.8	29	52.1	10.8	22	28.8	55.0	34.0	19	14.0	12	.....		.....	1.45	— 0.22	.....	NE.	.....	.....	.....	6	.....	.....	.....
Willcox	.....	.....	.....	.....	.....	.....	.....	.....	.....		37.9	.....	73.8	9	54.8	— 1.5	23	21.0	75.3	55.6	9	12.9	11	.....		.....	0.92	— 0.24	.....	W.	.....	.....	.....	8	.....	.....	.....
Yuma	141	29.94	+ .04	30.06	30.28	15	29.69	2	0.59		53.1	— 3.9	72.5	18	64.8	27.1	23	41.3	45.4	35.0	19	13.1	2	56.5		36.4	0.15	— 0.25	5,932	N.	40	NW.	21	1	0	4	27
Keeler	3,622	26.39	.....	30.07	30.37	11	29.51	29	0.86		42.9	.....	62.8	10	52.1	23.3	31	33.0	39.5	30.3	10	9.7	29	45.4		20.6	0.48	+ 0.30	5,145	N.	40	S.	29	4	3	10	18
Middle plateau.											28.8	— 5.6															1.22	— 0.24								
Fort Bidwell	4,615	25.43	.....	30.18	30.62	14	29.33	29	1.29		31.3	.....	51.4	7	40.4	9.6	22	20.0	41.8	31.0	4	9.4	6	84.8		27.0	2.40	— 2.53	5,052	W.	42	W.	25	14	10	12	9
Carson City	.....	.....	.....	.....	.....	.....	.....	.....	.....		33.5	.....	56.8	25	45.0	— 2.2	31	20.7	59.0	36.5	23	11.6	29	55.7		18.0	2.08	.....	.....	.....	.....	.....	.....	.....	.....	.....	6	3	12	16
Winnemucca	4,358	25.73	+ .06	30.24	30.68	14	29.42	29	1.26		28.0	— 7.0	48.0	25	38.8	1.3	4	15.6	40.7	36.0	23	10.2	1	76.9		20.8	1.55	+ 0.37	5,764	W.	39	W.	29	10	6	15	10
Frisco	6,406	23.69	.....	30.06	30.44	21	29.41	29	1.03		26.6	.....	44.3	18	33.9	0.4	21	16.3	43.9	25.7	28	8.1	1	65.3		15.9	0.76	+ 0.66	6,795	N.	58	SW.	29	7	1	12	18
Salt Lake City	4,348	25.70	+ .01	30.19	30.61	14	29.40	29	1.21		29.7	— 4.3	49.7	7	36.8	8.7	21	21.5	41.0	24.6	28	4.5	31	67.3		19.2	1.55	+ 0.13	3,406	SE.	40	S.	29	13	9	14	8
Montrose	5,780	24.29	.....	30.17	30.64	21	29.39	30	1.25		20.8	.....	47.6	29	33.3	—16.2	22	8.6	63.8	38.6	23	5.6	13	62.8		9.4	0.35	— 0.25	3,352	S.	42	SW.	30	6	4	13	14
Fort Bridger	6,643	23.46	.....	30.13	30.72	21	29.38	26	1.34		19.4	.....	42.0	7	29.9	—18.1	21	7.4	60.1	40.2	29	10.4	3	58.6		6.5	0.70	+ 0.14	7,930	W.	48	W.	30	9	9	19	3
Northern plateau.											35.2	+ 2.8															2.84	— 0.45								
Boisé City	2,750	27.28	+ .01	30.20	30.70	21	29.32	29	1.38		32.6	— 0.4	53.1	7	39.7	10.2	23	25.0	42.9	27.2	20	5.2	31	75.8		25.0	1.74	— 0.51	2,917	SE.	60	SE.	4	12	16	6	9
Ashland	.....	.....	.....	.....	.....	.....	.....	.....	.....		36.7	.....	58.0	6	44.5	17.0	22	28.9	41.0	27.0	14	8.0	12	.....		.....	3.38	— 1.27	.....	NW.	.....	.....	.....	12	.....	.....	.....
Fort Klamath	.....	.....	.....	.....	.....	.....	.....	.....	.....		26.9	.....	49.0	10	35.8	4.0	23	17.9	45.0	30.0	24	4.0	12	.....		.....	4.33	— 0.93	.....	W.	.....	.....	.....	17	.....	.....	.....
Lakeview	.....	.....	.....	.....	.....	.....	.....	.....	.....		31.2	.....	48.0	11	40.0	13.0	19	22.4	35.0	29.0	14	6.0	7	.....		.....	1.51	.....	.....	S.	.....	.....	.....	11	.....	.....	.....
Linkville	.....	.....	.....	.....	.....	.....	.....	.....	.....		31.4	.....	48.2	25	38.8	14.0	23	24.1	34.2	26.0	23	1.6	8	.....		.....	1.86	— 0.67	.....	NW.	.....	.....	.....	15	.....	.....	.....
Spokane Falls	1,909	27.97	—.05	30.05	30.73	20	29.32	29	1.41		33.0	+ 3.0	53.1	7	38.7	15.2	23	26.1	37.9	30.8	4	7.0	31	83.1		28.1	2.88	+ 0.36	4,433	SW.	26	SW.	5	18	20	8	3
Walla Walla	1,018	28.96	.....	30.07	30.72	20	29.34	29	1.38		39.9	+ 5.9	63.0	7	46.8	20.0	22	33.4	43.0	23.3	15	6.9	20	70.8		30.1	2.83	+ 0.33	6,054	SW.	36	SW.	7	13	17	8	6
N. Pac. coast region.											42.3	+ 0.2															13.05	+ 3.69								
Fort Canby	179	29.77	—.05	29.97	30.60	19	29.23	29	1.37		43.6	— 0.4	52.5	12	47.5	34.2	22	39.8	18.3	12.6	7	4.0	17	93.5		41.8	15.18	+ 5.26	13,830	SW.	84	S.	7	22	18	7	6
Neah Bay	.....	.....	.....	.....	.....	.....	.....	.....	.....		44.0	.....	56.0	17	52.0	28.0	27	36.0	28.0	.....	.....	.....	.....	.....		.....	22.57	.....	.....	.....	.....	.....	.....	22	.....	.....	.....
Olympia	36	29.96	—.01	30.00	30.68	20	29.31	29	1.37		41.3	+ 0.3	55.5	6	45.5	30.0	28	36.8	25.5	19.3	6	3.4	16	91.1		38.8	15.75	+ 4.14	3,405	S.	20	S.	4	22	20	10	1
Port Angeles	14	29.91	.....	29.93	30.68	20	29.18	4	1.50		39.3	— 1.7	51.8	17	44.7	29.2	21	33.6	22.6	16.1	3	3.2	22	90.0		36.2	6.07	+ 1.40	3,018	S.	26	E.	1	19	14	16	1
Pysht	.....	.....	.....	.....	.....	.....	.....	.....	.....		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tatoosh Island	86	29.82	.....	29.92	30.67	20	29.12	4	1.55		43.8	+ 1.1	52.0	16	47.0	35.4	6	40.3	16.6	16.6	6	3.6	10	88.3		40.4	17.47	+ 2.75	12,229	SE.	51	SW.	5	25	23	7	1
Astoria	.....	29.92	.....	.....	.....	.....	.....	.....	.....		43.1	.....	55.0	16	46.9	32.0	23	40.2	23.0	14.0	6	1.8	22	89.2		40.2	16.64	+ 6.87	6,602	SW.	48	SW.	7	24	24	3	4
Portland	80	29.97	+ .01	30.06	30.64	20	29.34	29	1.30		42.6	+ 1.6	57.0	7	47.0	28.7	23	37.9	28.3	16.2	26	5.3	28	89.8		39.6	11.34	+ 2.98	5,323	S.	36	S.	7	21	23	6	2
Roseburg	523	29.56	+ .06	30.13	30.60	19	29.25	28	1.35		43.1	+ 0.1	58.0	11	48.7	26.3	21	35.7	31.7	30.3	26	7.5	22	84.3		38.2	8.89	+ 2.46	2,783	S.	30	SW.	4	22	19	12	0
Mid. Pac. coast reg.											48.9	— 0.1															2.58	— 2.04								
Eureka	.....	.....	.....	.....	.....	.....	.....	.....	.....		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Red Bluff	342	29.80	+ .05	30.14	30.39	13	29.42	29	0.97		48.2	+ 1.2	67.7	18	55.6	31.8	23	40.2	35.9	25.9	24	6.8	1	67.4		35.5	2.32	— 2.74	5,628	N.	45	S.	29	11	11	10	10
Sacramento	64	30.08	+ .02	30.14	30.35	6	29.50	29	0.85		46.9	— 1.1	65.0	20	55.6	29.0	27	37.6	36.0	31.5	19	7.5	29	77.6		39.7	2.09	— 1.95	5,064	SE.	40	SE.	1	8	3	13	15

Meteorological record of voluntary observers and Army post surgeons, December, 1887.

The maximum and minimum temperatures at stations marked thus (*) are from readings of other than standard instruments.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation.
Alabama.	°	°	°	*Inches*
Livingston	67	21	45.0	9.65
Mt. Vernon B'ks	70	23	50.3	9.92
Newmarket	53	12	36.4	4.30
Arizona.				
Huachuca, Fort	65	0	37.7	1.80
McDowell, Fort	71	16	46.0	0.67
Mojave, Fort	69	20	50.5	0.80
Tucson	.....	.....	.....	0.27
Arkansas.				
Hot Springs	64	27	40.1	11.16
Lead Hill	67	— 1	35.0	3.69
British Columbia.				
New Westminster	53	24	38.0	11.40
California.				
Alcatraz Island	66	41	51.2	3.80
Angel Island	78	38	53.6	2.47
Benicia Barracks	69	39	49.1	3.50
Bidwell, Fort	48	10	32.5	1.77
Fall Brook	75	33	49.8	3.56
Gaston, Fort	55	21	42.5	8.36
Georgetown	62	24	43.6	7.66
Hydesville	.....	.....	.....	6.65
Lewis Creek*	60	32	46.0	1.08
Mason, Fort	63	49	52.0	2.97
Nicolaus *	72	28	48.9	3.02
Oakland	67	35	49.5	3.22
Oroville	67	34	51.0	2.62
Presidio of San F	71	32	50.8	2.44
Riverside	72	30	65.6	1.50
Sacramento	61	24	42.6	2.89
Salinas	66	32	46.6	2.16
San Gorgonio Pass	74	30	.....	.....
Willows	64	28	47.7	1.55
Colorado.				
Grand Junction*	52	— 5	18.5	0.88
Lewis, Fort	40	—30	15.9	1.12
Connecticut.				
North Colebrook*	52	— 2	24.9	3.63
Southington	55	6	29.0	5.30
Voluntown	60	4	31.5	5.65
Dakota.				
A. Lincoln, Fort	48	—28	9.1	0.90
Garden City	36	—24	9.0	1.25
Meade, Fort	52	—32	22.1	0.36
Pembina, Fort	42	—42	2.5	0.76
Randall, Fort	41	—17	15.3	4.21
Richardton	40	— 25	8.9	3.00
Sisseton, Fort	34	—30	5.6	1.37
Sully, Fort	49	—18	14.1	0.48
Totten, Fort	40	—32	4.5	1.27
Webster	40	—36	10.7	2.59
Yates, Fort	45	—25	11.4	.....
District of Columbia.				
Aqueduct office*	60	18	40.0	.....
Distribut'g res'v'r *	58	17	38.1	4.58
Receiving res'v'r*	58	15	37.5	4.70
Kendall Green	57	16	36.2	3.98
Florida.				
Alva*	80	39	61.6	3.22
Archer*	82	28	59.3	5.65
Duke	78	35	60.3	2.81
Fort Meade*	83	30	59.0	2.50
Homeland*	82	45	64.9	2.95
Limona*	81	41	63.9	3.42
Manatee	85	35	64.3	3.20
Merritt's Island	79	47	63.9	1.89
Fort St. Augustine	76	32	57.5	0.34
Tallahassee	72	29	54.1	8.35
Georgia.				
Andersonville	78	22	48.1	6.82
Athens	62	16	41.2	5.50
Forsyth *	74	22	48.1	7.56
Milledgeville*	66	21	45.9	5.92
Quitman	72	30	52.4	9.55
Idaho.				
Boisé Barracks	56	9	32.7	0.78
Lewiston	.....	.....	.....	1.36
Sherman, Fort	46	9	32.2	6.66
Illinois.				
Charleston *	55	— 5	29.9	4.75
Jacksonville	55	— 7	28.3	3.03
Oswego	.....	.....	25.1	3.38
Rockford	50	—19	23.6	5.01
Sandwich*	53	10	27.4	5.35
South Evanston	54	9	.....	3.45
Indiana.				
Butlerville*	59	— 4	32.3	3.36
Jeffersonville	59	4	35.2	3.16
Laconia	60	3	33.9	3.13
La Grange	51	— 4	.....	3.75
Logansport *	59	— 5	31.0	3.80
Mauzy	55	— 5	26.9	3.79
Sunman *	55	— 4	30.4	3.62
Vevay	57	2	35.5	3.29
Indian Territory.				
Reno, Fort	66	— 2	34.1	0.79
Supply, Fort	60	—10	.....	0.64
Iowa.				
Albia	76	—13	24.3	4.40
Algona	.....	.....	19.4	5.60
Bancroft	38	—20	11.6	1.18
Cedar Rapids a	50	—17	22.7	2.72
Clarinda	45	— 6	29.7	1.00
Cresco	37	—25	18	2.58
Des Moines	57	—16	23.4	3.50
Fort Madison	46	—11	25.4	1 61
Humboldt	39	—22	16.6	1.78
Independence *	44	—16	21	2.44
Logan *	45	—16	23.0	2.00
Mount Vernon *	41	—19	22.0	.....
Monticello	46	—19	21.4	3.22
Muscatine	43	—14	24.2	3.53
Oskaloosa a	47	—16	24.1	2.01
Oskaloosa b *	.....	.....	22.0	2.00
Webster City	48	—16	19.8	.....
Kansas.				
East Norway*	57	— 3	28.5	0.35
El Dorado	62	—11	29.2	0.70
Elk Falls	64	— 5	.....	1.78
Emporia	56	— 5	28.7	0.73
Globe	56	—13	27.3	2.11
Hays, Fort	60	—15	26.4	0.90
Independence	62	— 7	30.3	1.86
Lawrence	60	— 8	28.1	2.08
Manhattan	56	—11	25.8	0.88
Marydale Farm	59	— 8	26.8	2.37
Morse*	58	—12	35.0	2.50
Riley, Fort	52	—10	27.4	0.64
Salina *	43	3	28.2	0.90
Wakefield*	53	— 8	28.5	2.89
Wellington	58	— 5	31.8	0.83
Wilson	55	—10	26.5	0.27
W. Leavenworth*	62	— 4	.....	.....
Yates Centre	62	—11	28.2	1.13
Kentucky.				
Bowling Green*	62	6	39.4	2.56
Frankfort	63	3	.....	3.66
Louisiana.				
Grand Coteau	70	29	51.8	7.80
Liberty Hill	67	30	49	7.48
Maine.				
Bar Harbor	53	— 6	.....	5.11
Cornish	51	— 3	24.2	2.88
Gardiner	50	— 4	25.5	5.61
Kent's Hill	50	—10	22.0	4.25
Orono	51	—10	23.7	4.72
Skowhegan	46	—18	20.9	4.50
Maryland.				
Cumberland	50	12	32.9	3.00
Fallston	56	11	33.4	6.40
Great Falls *	60	13	30.3	3.00
McDonogh	56	12	34.2	3.85
McHenry, Fort	65	15	30.5	2.68
New Midway*	56	14	35.1	6.05
Woodstock	56	12	34	4.19
Massachusetts.				
Amherst a	51	— 6	26.6	4.11
Amherst b	52	— 2	29.7	3.47
Blue Hill Obs'ya	60	6	32	3.30
Blue Hill Obs'yb	56	1	28.9	4.14
Deerfield	49	— 9	25.8	4.50
Fall River	57	7	31.9	4.55
New Bedford	50	5	31.8	4.27
North Truro	.....	.....	.....	4.40
Somerset	60	3	32.4	3.93
Taunton	58	5	31.9	4.31
Westborough*	63	4	32.0	3.85
Michigan.				
Birmingham	55	— 3	27.3	3.22
Brady, Fort	48	— 0	23.4	0.40
Harrisville*	55	1	28.0	1.23
Hudson	43	— 8	.....	2.15
Kalamazoo a	53	2	27.4	3.26
Kalamazoo b	53	3	20.5	3.26
Lansing	54	— 3	27.6	2.52
Mottville*	56	—14	20.2	3.15
Thornville*	55	7	28.0	2.13
Traverse City	50	6	28	3.84
West Branch	55	— 4	27.7	5.05
Minnesota.				
Minneapolis	39	—22	15.9	3.80
Snelling, Fort	37	—18	16.1	1.62

Meteorological record of voluntary observers, etc.—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation.
Mississippi.	°	°	°	*Inches*
Biloxi	67	28	50.9	10.13
Missouri.				
Conception	55	—12	24.2	0.73
Fayette	58	—11	28.6	3.42
Frankford	56	—10	23.6	3.12
Montana.				
Keogh, Fort	53	—24	14.6	0.31
Missoula, Fort	52	— 6	26.7	0.38
Shaw, Fort	55	—25	19.9	.....
Nebraska.				
Brownville*	50	16	28.0	0.08
De Soto *	45	—14	21.9	1.27
Fremont*	47	—11	18.0	1.85
Genoa	50	—18	20.1	0.59
Hay Springs	46	—28	18.4	1.61
Kimball	63	—12	.....	5.00
Marquette	44	— 2	.....	0.95
Niobrara, Fort	55	—26	19.6	0.20
Robinson, Fort	52	—26	24.3	0.02
Sidney, Fort	59	—17	24.6	0.16
Tecumseh *	50	—14	24.8	0.83
University of Nebr.	49	— 6	23.5	0.70
Nevada.				
Carson City	58	— 4	31.2	2.08
McDermit, Fort	47	9	27.7	.....
New Hampshire.				
Antrim	.....	.....	.....	4.01
Ashland	.....	.....	.....	5.31
Belmont	.....	.....	.....	4.20
Berlin Mills	49	—13	.....	4.74
Bristol	.....	.....	.....	5.09
Lake Village	.....	.....	.....	4.53
Nashua	55	— 2	27.7	4.07
Wier's Bridge	.....	.....	.....	4.67
Wolfeborough	.....	.....	.....	5.47
Woodstock	.....	.....	.....	4.71
New Jersey.				
Beverly	59	13	33.8	5.01
Clayton*	59	13	34.5	4.62
Dover	58	10	30.4	6.78
Egg Harbor City	58	10	34.7	5.04
Moorestown	58	12	33.5	4.92
Readington *	62	14	35.2	.....
Salem	60	14	34.9	3.87
Vineland	59	15	37.4	4.31
New Mexico.				
Bayard, Fort	74	— 3	37.7	0.27
Gallinas Spring	58	5	.....	0.13
Las Vegas	57	—12	.....	T.
Selden, Fort	66	— 4	40.4	0.24
Union, Fort	63	—12	30.7	3.75
Wingate, Fort	45	— 7	23.7	1.10
New York.				
Auburn	57	— 2	30.9	3.40
Ardenia	57	10	.....	4.91
Boyd's Corners	57	8	.....	6.71
Brooklyn	58	11	34.3	3.84
Columbus, Fort	55	14	35.1	4.29
Cooperstown	45	— 4	25.7	3.43
Factoryville	54	2	29.6	2.00
Friendship	52	4	28.7	3.00
Humphrey	49	2	27.6	2.60
Ithaca	57	— 5	29.5	2.48
Madison Barracks	49	— 9	20.7	1.62
Menands	44	— 2	26.8	3.76
Niagara, Fort	53	12	31.5	.....
North Volney	53	— 5	27.2	.....
Plattsburg B'ks	48	—14	21.5	1.76
Palermo *	54	—10	25.4	2.45
Palmyra	56	1	30.3	.....
Penn Yan	.....	.....	.....	2.38
Setauket	58	14	36.0	3.42
Syracuse	60	— 2	27.9	.....
Utica	46	— 4	25.3	4.59
West Point	55	5	30.7	5.38
White Plains	50	8	36.2	6.40
Worcester	56	— 5	.....	.....
North Carolina.				
Chapel Hill	68	14	42.1	6.19
Hot Springs	65	14	40.3	.....
Lincolnton	54	19	41.7	3.97
Raleigh	69	16	43	4.70
Statesville*	60	16	39.6	4.50
Weldon *	64	14	40.1	4.20
Ohio.				
Cleveland	57	5	32.2	1.77
College Hill*	50	— 3	32.2	3.50
Garrettsville	55	4	28.7	2.65
Hiram	53	4	29.3	2.00
Jacksonborough	58	— 4	30.0	3.35
Napoleon	51.6	2	30.3	2.30
New Athens	53	3	.....	.....
North Lewisburg	58	— 1	30.5	2.50
Ruggles*	53	3	30.4	3.10
Tiffin *	52	3	30.0	2.83
Wauseon	58	— 4	26.9	2.69
Westerville	54	— 1	32.2	2.34
West Milton *	50	— 2	32.0	6.50
Yellow Springs	54	— 3	30.9	3.31
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Albany	53	28	42.2	14.21
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Altoona	60	10	35.8	1.16
Blooming Grove *	57	3	29.1	3.10
Corry *	54	3	27.9	2.19
Driftton	57	1	28.5	3.91
Dyberry	52	— 6	26.1	4.19
Easton	.....	.....	.....	6.01
Franklin *	.....	.....	28.7	2.16
Germantown	56	10	.....	7.15
Indiana	57	13	35.0	.....
Meadville	52	16	33.7	0.94
Phillipsburg	58	0	29.8	1.77
Quakertown	58	3	29.8	6.05
State College	52	3	29.7	2.25
Wellsborough *	60	8	30.7	1.30
West Chester	57	11	32.7	6.81
Westtown	58	8	32.5	6.41
Wilkesbarre	54	6	31.0	3.61
South Carolina.				
Aiken	69	23	49.5	4.74
Kirkwood	58	19	40.1	3.54
Stateburg *	66.9	23	45.3	3.31
Tennessee.				
Ashwood	60	9	34.5	5.96
Austin	66	8	38.5	3.78
Milan	61	11	38.4	3.60
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Cleburne *	74	10	40.4	0.86
Cedar Hill	70	14	42.0	0.70
Concho, Fort	73	12	43.2	0.98
Corsicana	.....	.....	.....	2.96
Decatur	71	11	39.0	1.94
McIntosh, Fort	79	25	51.3	3.82
Mesquite	74	14	42.0	3.62
Midland *	70	9	37.5	0.90
New Ulm	72	27	49.3	4.97
Ringgold, Fort	85	22	53.5	5.03
Silver Falls	63	10	37.2	0.30
Vermont.				
Burlington	48	—12	23.4	3.44
Brattleborough	51	—10	.....	5.28
Manchester	50	—13	24.6	6.09
Newport *	45	—26	20.7	1.50
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Virginia.				
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Dale Enterprise*	62	6	36.2	3.14
Marion	62	4	37.0	2.61
Monroe, Fort	58	14	41.4	3.73
Petersburg	64	15	45.8	3.92
Summit*	59	7	33.6	.....
University of Va	50	22	35.8	4.42
Variety Mills	60	9	34.9	4.04
Wytheville	68	8	35.3	2.91
Washington Territory				
Blakely *	56	30	42.0	7.89
Spokane, Fort	54	10	31.9	2.38
Tacoma *	58	30	40.8	10.26
Townsend, Fort	57	30	42.6	3.45
Vashon	52	30	38.8	10.07
Walla Walla, Fort	61	20	38.7	1.44
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Franklin	45	.....	21.0	3.00
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Lancaster	45	—21	18.6	3.31
Manitowoc	44	—13	27.6	2.91
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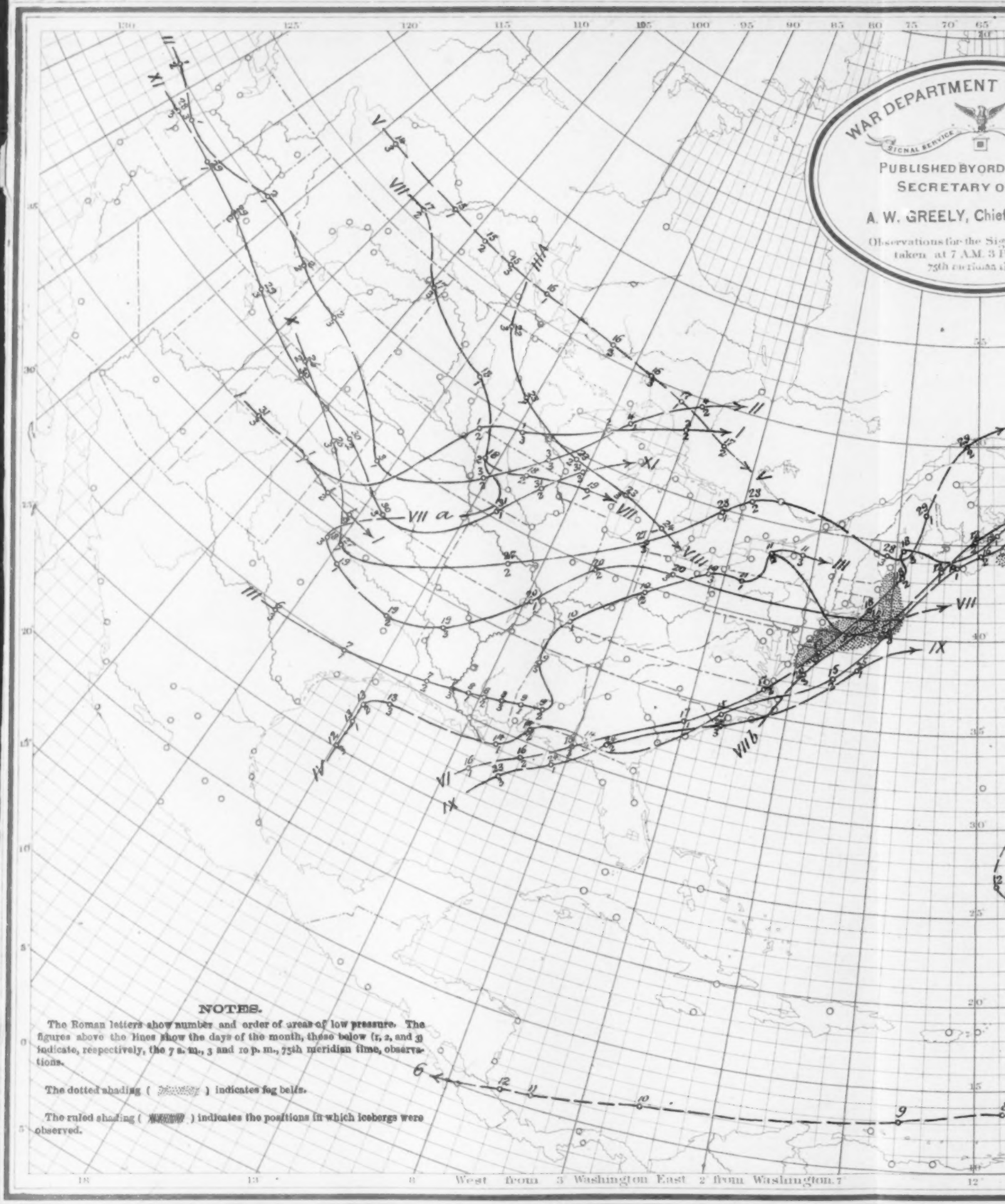
Chart I. Tracks of Are



NOTES.

The Roman letters show number and order of areas of low pressure. The figures above the lines show the days of the month, those below (1, 2, and 3 indicate, respectively, the 7 a. m., 3 and 10 p. m., 75th meridian time, observations.

The dotted shading ( ) indicates fog belts.

The ruled shading ( ) indicates the positions in which icebergs were observed.

West from 3 Washington East 2 from Washington. 7

f Areas of Low Pressure. December, 1887.

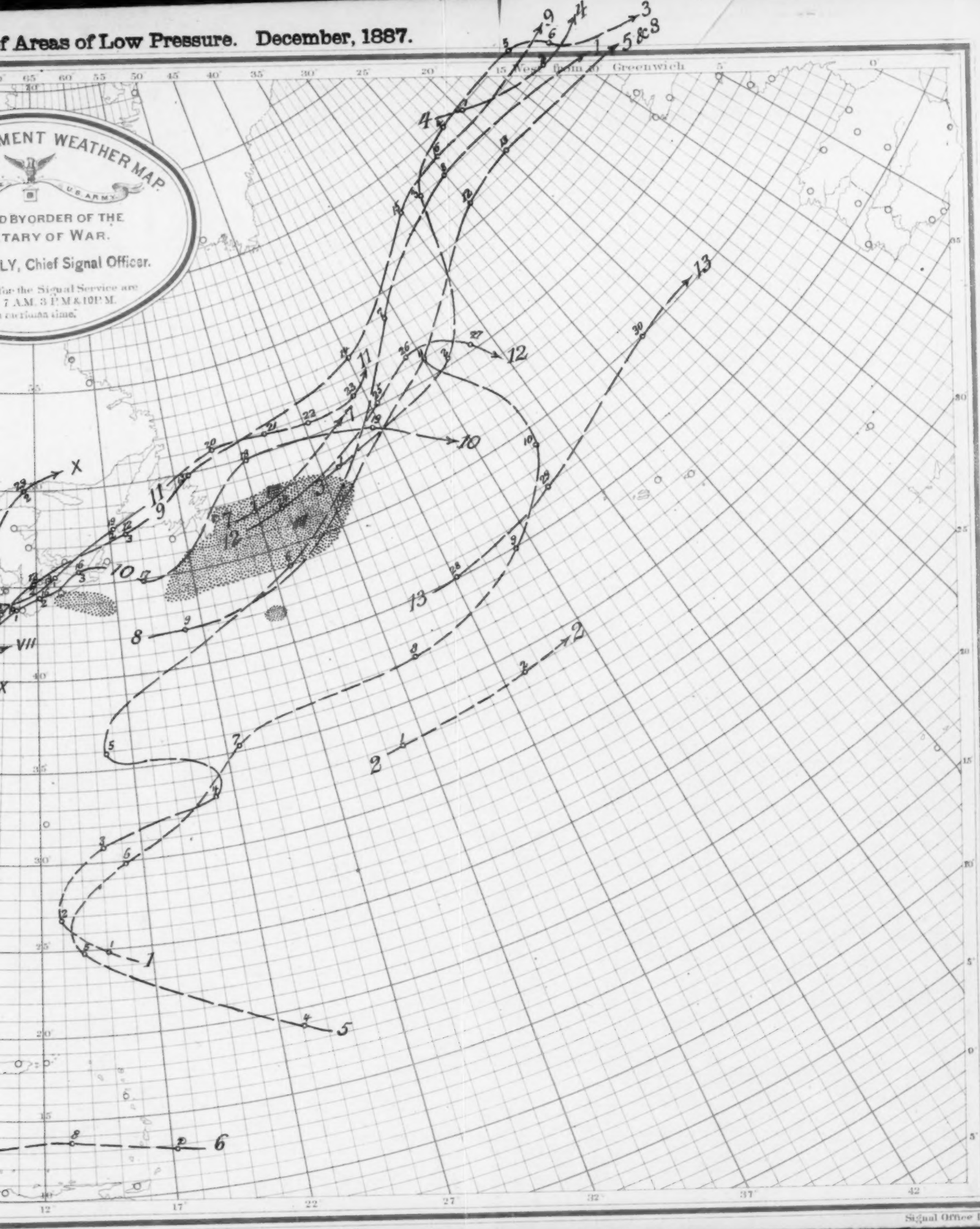
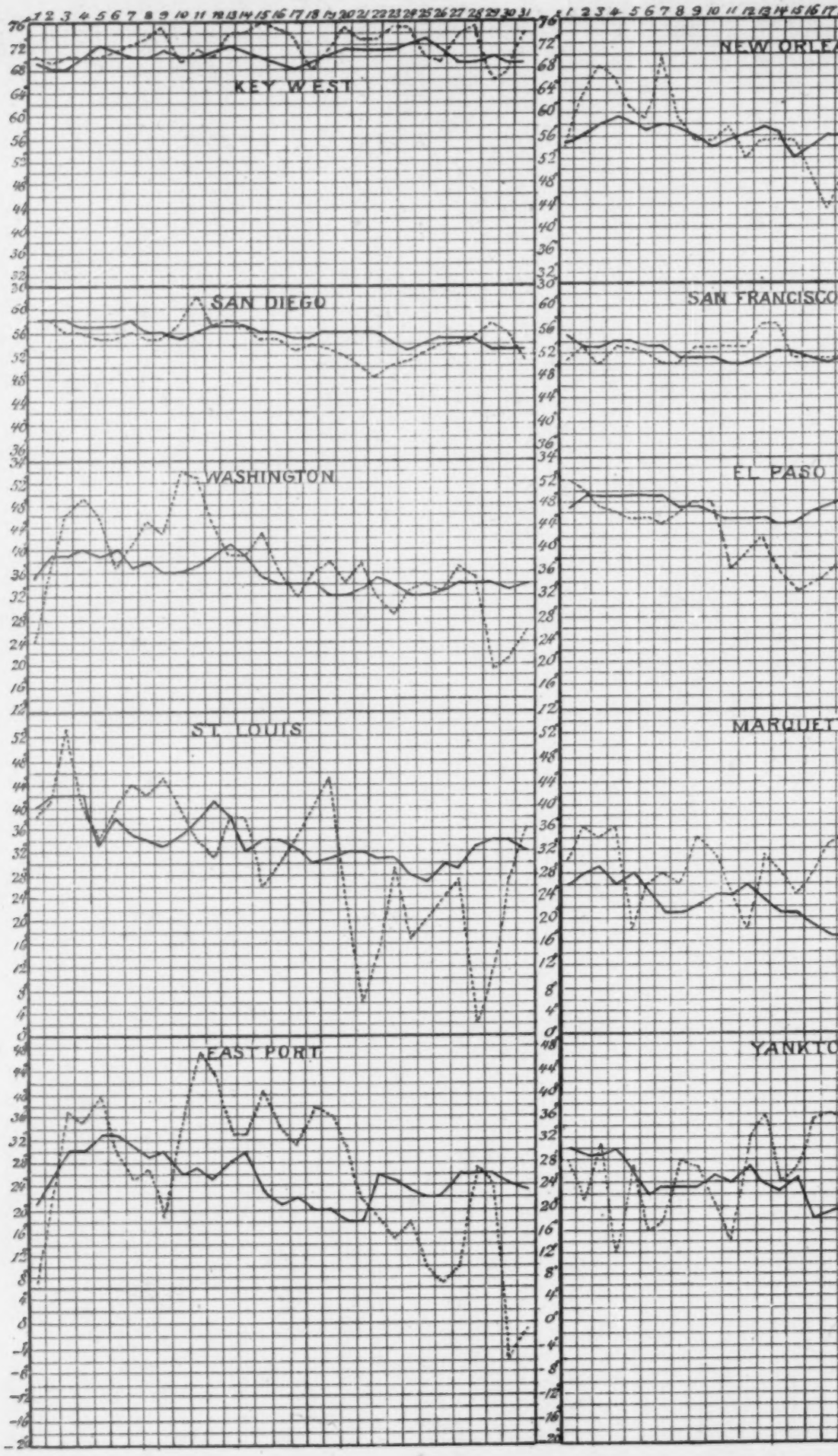


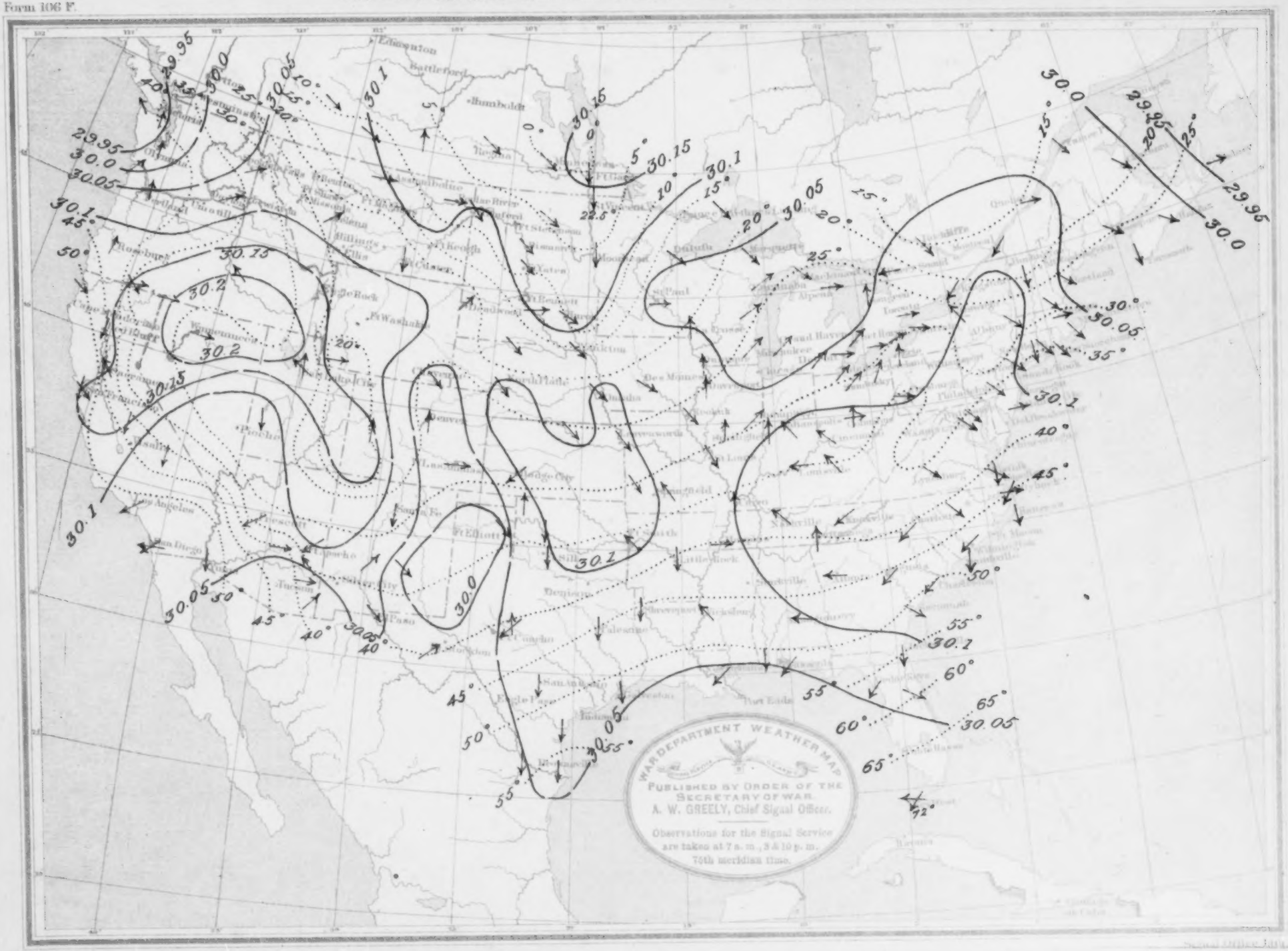
Chart III. Normal December temperatures for a number of yea



of years [———]. Mean temperature of December, 1887 [- - - - -].

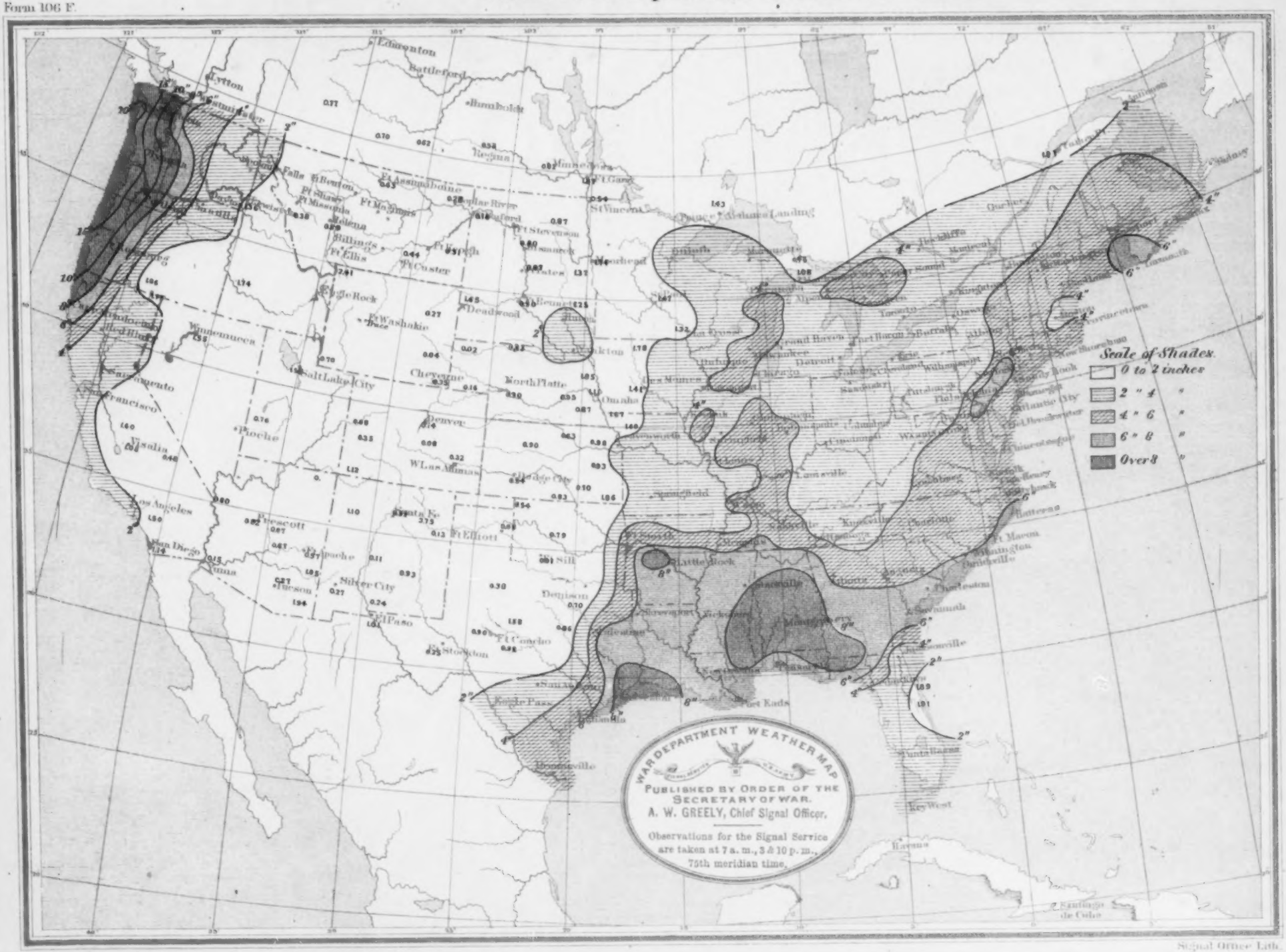
Form 106 F.

Chart II. Isobars, Isotherms, and Winds. December, 1887.


WAR DEPARTMENT WEATHER MAP
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
A. W. GREELY, Chief Signal Officer.
Observations for the Signal Service are taken at 7 a. m., 3 & 10 p. m. 75th meridian time.

Form 106 F.

Chart IV. Precipitation, December 1887.


Scale of Shades.
0 to 2 inches
2 " 4 "
4 " 6 "
6 " 8 "
Over 8 "
WAR DEPARTMENT WEATHER MAP
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
A. W. GREELY, Chief Signal Officer.
Observations for the Signal Service are taken at 7 a. m., 3 & 10 p. m., 75th meridian time.

Signal Office Lith.

Voluntary observers of the Signal Service, on land, from whom meteorological reports were received in time to be used in the preparation of the Monthly Weather Review for December, 1887.

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Arents, Hiram, Oroville, Cal.
Adams, A. H., Fort Meade, Fla.
Adams, Dr. O. H., Vineland, N. J.
Andrews, Luman, Southington, Conn.
Arden, Richard B., Garrison's, N. Y.
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Bell, Joseph, Franklin, Pa.
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Bently, David, Willows, Cal.
Bayerly, J. F., Spartanburg, S. C.
Ballou, Dr. N. E., Sandwich, Ill.
Bennett, Geo., Bandon, Oregon.
Boies, Lt. A. H., Hudson, Mich.
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Beall, Dr. R. L., Lenoir, N. C.
Bartlett, E. B., Vermillion, N. Y.
Briggs, John, Albany, Oregon.
Betts, Prof. Arthur, Webster, Dak.
Breed, J. E., Embarras, Wis.
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Birt, Thomas, Utica, N. Y.
Broberg, Mrs. Mary W., Manatee, Fla.
Black, W. H., Kalamazoo, Mich.
Blachly, C. P., Manhattan, Kans.
Bridges, Q. A., Berlin Mills, N. H.
Bowman, Peter, Ruggles, Ohio.
Bush, John W., Worcester, N. Y.
Boyd, Joseph, Oskaloosa, Iowa.
Blockman, L. E., Santa Maria, Cal.
Barton, Wm. G., Kimball, Nebr.
Brendle, Dr. Fred, Peoria, Ill.
Cass, John J., Allison, Kans.
Child, W. H., Brattleborough, Vt.
Colton, Prof. G. H., Hiram, Ohio.
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Chatfield, F. W., Las Vegas, N. Mex.
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Cass, W. Earle, Roseland, N. J.
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Dunlap, W. L., Tecumseh, Nebr.
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Fleming, John, Readington, N. J.
Fuller, Edw. N., Tacoma, Wash.
Featherston, Wm., Globe, Kans.
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Fitzgerald, C. M., Georgetown, Cal.
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Newcomb, G. S., Westborough, Mass.
Nordberg, Prof. A., Richardton, Dak.
Newell, Dr. W. C. T., Garden City, Dak.
Neal, Dr. J. C., Archer, Fla.
Owsley, Dr. J. B., Jacksonborough, Ohio.
Osborn, Dr. T. C., Cleburne, Tex.
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Pearce, Thomas, Eola, Oregon.
Prouty, Florence, Humboldt, Iowa.
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Richmond, S. L., Salem, N. Y.
Rodgers, Jesse D., Nile, N. Y.
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Strong, W. C., Kent's Hill, Me.
Stern, Jacob T., Logan, Iowa.
Smith, H. D., Monticello, Iowa.
Shaw, E., Ninnescah, Kans.
Seltz, Chas., De Soto, Nebr.
Shriver, E. T., Cumberland, Md.
Smith, Prof. T. Berry, Fayette, Mo.
Schleicher, Rob't Lewiston, Idaho.
Shriver, Howard, Wytheville, Va.
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Stucky, Dr. C. T., Helvetia, W. Va.

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Silvius, U. O., Franklin, Wis.
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Sim, J. R., Summit, Va.
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Swartz, John J., Parkston, Dak.
Samostz, Oscar, Austin, Tex.
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Teele, Rev. A. K., Blue Hill, Mass.
Truman, Geo. S., Genoa, Nebr.
Turnbo, Silas C., Pro Tem, Mo.
Tuohy, John, Lewis Creek, Cal.
Thomas, Felix, Saratoga Springs, N. Y.
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Voegell, Adolphus, Des Moines, Iowa.
Van Sandt, A. S., Clarinda, Iowa.
Warren, J. H., West Bend, Iowa.
Wadsworth, Dr. J. Le R., Collinsville, Ill.
Wilson, W. C., Clayton, N. J.
Wickersham, Wm. F., Westtown Pa.
Went, E. C., Frankfort, Ky.
Wedge, J. C., Fond du Lac, Wis.
Wade, J. S., Homeland, Fla.
Washburn Observatory, Madison, Wis.
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Williams, Rev. C. F., Ashwood, Tenn.
West, Silas, Cornish, Me.
Wells, Rev. Charles L., Gardiner, Me.
Wait, S. E., Traverse City, Mich.
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Woodstock College, Woodstock, Md.
Wolfe, John H. Wellington, Kans.
Wülfke, E. F., Independence, Iowa.
Wearmouth, James, University of Virginia, Va.
Winipiseogee Lake Cotton and Woolen Manufacturing Co. — Weir's Bridge, N. H.; Woodstock, N. H.; Wolfeborough, N. H.; Lake Village, N. H.; Bristol, N. H.; Belmont, N. H.; Ashland, N. H.
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Wigg, Dr. Geo., East Portland, Oregon.
Wright, J. W. A., Livingston, Ala.
Whitney, Chas. E., Humphrey, N. Y.
Whitney, William A., Skowhegan, Me.
Widman, Rev. C. M., Grand Coteau, La.
Williams, Dr. A. C., Elk Falls, Kans.
White, Rev. J. H., Georgiana, Fla.
Wetmore, Edw. L., Tucson, Ariz.
Whitmore, J. E., Gallinas Spring, N. Mex.
Walton, J. P., Muscatine, Iowa.
Waterman, Wm., Hay Springs, Nebr.
Webster, Chas. H., Nashua, N. H.
Yates, T. P., Factoryville, N. Y.
Yetter, Wm. G., Catawissa, Pa.
Young, Geo. R., Penn Yan, N. Y.

Military posts from which meteorological reports were received, through the Surgeon General of the Army, in time to be used in the preparation of the Monthly Weather Review for December, 1887.

Alcatraz Island, Cal.
Angel Island, Cal.
A. Lincoln, Fort, Dak.
Bayard, Fort, N. Mex.
Benicia Barracks, Cal.
Bidwell, Fort, Cal.
Brady, Fort, Mich.
Boisé Barracks, Idaho.
Concho, Fort, Tex.
Columbus, Fort, N. Y. H.
Camp Sheridan, Wyo.
Gaston, Fort, Cal.
Gibson, Fort, Ind. T.
Hays, Fort, Kans.
Hot Springs, Ark.
Huachuca, Fort, Ariz.
Klamath, Fort, Oreg.
Keogh, Fort, Mont.
Lewis, Fort, Colo.
Laramie, Fort, Wyo.
Meade, Fort, Dak.
McIntosh, Fort, Tex.
Missoula, Fort, Mont.
Mason, Fort, Cal.
McDermit, Fort, Nev.
McDowell, Fort, Ariz.
Monroe, Fort, Va.
Mojave, Fort, Ariz.
Madison Barracks, N. Y.
McHenry, Fort, Md.
Mount Vernon B'ks, Ala.
McKinney, Fort, Wyo.
Niagara, Fort, N. Y.
Niobrara, Fort, Nebr.
Pembina, Fort, Dak.
Presidio of San F., Cal.
Plattsburg Barracks, N. Y.
Robinson, Fort, Nebr.
Reno, Fort, Ind. T.
Randall, Fort, Dak.
Ringgold, Fort, Tex.
Riley, Fort, Kans.
Snelling, Fort, Minn.
St. Francis B'ks, St. Augustine, Fla.
Sisseton, Fort, Dak.
Shaw, Fort, Mont.
Sherman, Fort, Idaho.
Selden, Fort, N. Mex.
Supply, Fort, Ind. T.
Sully, Fort, Dak.
Spokane Fort, Wash.
Sidney, Fort, Nebr.
Totten, Fort, Dak.
Townsend, Ft., Wash.
Union, Fort, N. Mex.
Washakie, Fort, Wyo.
West Point Military Academy, N. Y.
Walla Walla, Ft., Wash.
Wingate, Fort, N. Mex.
Yates, Fort, Dak.

State weather services from which meteorological reports were received in time to be used in the preparation of the Monthly Weather Review for December, 1887.

Alabama, P. H. Mell, jr., Signal Corps, director, Auburn, Ala.
Illinois, Col. Charles F. Mills, director, Springfield, Ill.
Indiana, Prof. H. A. Huston, director, Lafayette, Ind.
Louisiana, R. E. Kerkam, Sgt., Signal Corps, director, New Orleans, La.
Michigan, N. B. Conger, Sgt., Signal Corps, director, Lansing, Mich.
Mississippi, Prof. R. B. Fulton, director, University, Miss.
Missouri, Prof. F. E. Nipher, director, Saint Louis.
Nebraska, Prof. Goodwin D. Swezey, Director, Crete, Nebr.
New England Meteorological Society, Prof. Wm. H. Niles, of Boston, Mass., President; Prof. W. M. Davis, of Cambridge, Mass., Secretary.
New Jersey, Prof. George H. Cook, director, New Brunswick, N. J.
North Carolina, Dr. Herbert Battle, director, Raleigh, N. C.
Ohio, Prof. Benj. F. Thomas, director, Ohio State University, Columbus, Ohio.
Oregon, B. S. Pague, Sgt., Signal Corps, Roseburg, Oregon.
Pennsylvania, under direction of Franklin Institute, Philadelphia, Pa.
South Carolina, Hon. A. P. Butler, director, Columbia, S. C.
Tennessee, J. D. Plunket, M. D., director; H. C. Bate, assistant, Nashville, Tenn.

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